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The

Practical Medicine Series

COMPRISING EIGHT VOLUMES ON THE YEAR'S PROGRESS IN MEDICINE AND SURGERY

The Eye, Ear, Nose and Throat

EDITED BY

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THE EYE

Introduction

Ophthalmology and the General Practitioner. As one thinks back over the past decade to determine what advances have been made in ophthalmology that are of possible interest to the general practitioner of medicine one is quickly struck by the realization that whatever advances have been made have been largely influenced by the forward strides achieved in the various other branches of practical and theoretical medicine. The inter-relationship is very close. Ophthalmology has been quick to grasp the new ideas that have arisen concerning focal infection, vaccine therapy, renal pathology, tuberculosis, etc., and applying them to the eye has shown how in many ways ocular examination, both internal and external, may be of very practical value to the general practitioner in the care and treatment of these extra-ocular affairs.

In a short article G. W. Vandegrift[1] mentions briefly a few inter-relationships which will prove easily the premises stated in the above paragraph. Uveal disease has always been a *bête noire* to the ophthalmologist. Despondency and pessimism have been the dominant strain of writers upon the subject but fortunately in the past few years this note has brightened, largely on account of the advances made in the knowledge of focal infections and vaccine therapy. Less and less do we cloak our ignorance in that unfit and unscientific term—idiopathic. Idiopathic iritis, uveitis, choroiditis were once common. Today in most cases the causative infection can be found, if not by the ophthalmologist himself then by the laboratory worker, the urologist, the gastro-

(1) Am. Med., June, 1929.

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enterologist or other special worker. There are still cases where the etiologic factor cannot be found but the wise practitioner does not say idiopathic. He realizes that the uveal tract is the circulatory tunic of the eye and a part of the general circulation. He confesses his limitations and hopes that the practice of medicine will soon broaden and deepen his knowledge of obscure lesions. The connotations here are easily discerned. If the ophthalmologist is very dependent upon other workers for assistance the opposite is also true for the pathologic aspects of the ocular lesions may be very helpful to a better understanding of causative factors elsewhere in the body.

Tuberculous lesions of the eye offer another field of study where the same statements hold true. Very great advance in the care and treatment of ocular tuberculosis has arisen in the past few years. We have learned the scope and limitations of tuberculin practice. Many obscure lesions of the uvea and the fundus, quite apart from distinct and clear-cut tubercles, whose etiology has been hitherto unknown, have been found to be attendant upon tuberculosis in other parts of the body, the clarification of which, again, has been due to the diagnostic ability of other branches of medical practice. Tuberculin has been found quite effective in anterior lesions of the globe especially those of the cornea, less often of the uvea. Upon the lesions of the choroid, the retina and the optic nerve tuberculin has little effect and not infrequently that effect is deleterious. A probable explanation is that anterior ocular tuberculosis largely attends skin tuberculosis, displayed by glandular affection, while fundal tuberculosis more often accompanies tuberculosis of the lungs and abdominal organs, far less hopeful and less amenable manifestations.

It is a question whether the diagnosis and treatment of ocular syphilis has made any great strides forward in the last decade. Nor is it likely that any ever will be made that will measure up to the accomplishments

performed with the advent of the Wassermann reaction and arsphenamin therapy. Better surety of diagnosis and treatment has slowly evolved since then until at present syphilis of the eye, if properly handled, need no longer lead to the marked destruction of tissue and degree of blindness so frequently seen when the present century was ushered in. Here again the syphilologist has aided the forward trend of ophthalmology and it may be remembered that luetic lesions of the eye, which frequently are pathognomonic, may be of assistance in clearing up obscure and debatable general syphilitic diagnosis.

Recent advances have been made in the diagnosis and treatment of certain ocular lesions that are gratifying and often startling. *X*-ray and radium have been used with unquestionable success not only in superficial lesions such as epithelioma but also as adjuvants to surgery in deeper seated tumors of the globe and adnexa. Physical therapy has an undoubted field in ophthalmology. The pain of supra-orbital neuralgia, the intense suffering from acute glaucoma and acute iritis may be mitigated by the judicious use of light and heat. The effects of these are more profound and comforting than the old method of applications of hot water. They may likewise be used as accompaniments in the treatment of chronic iritis, chronic glaucoma, blepharitis and uveitis but with what success only the future will discover.

There is no field where the ophthalmologist and general practitioner as well as other specialists come more closely into contact than in the fundus of the eye. Its lesions are seldom local, for its manifestations are usually the danger signals of distant if not general maladies. The ophthalmoscope should be an instrument as familiar and as ready at hand as the sphygmomanometer, the head mirror and the tongue depresser. The aspects of the normal fundus should be as well known as the appearance of the normal nasopharynx. A few variations from the normal should be recognized by every

physician. The arterio-venous system of the eye is part of the general circulation and the retinal vessels lie open to the view of any man who takes the time and care to look. Arteriosclerosis may be discovered in the eye, not infrequently, before it is determined by any other means. The tortuosity of the vessels is distinct and unforgettable. This of course may not always mean a hardening of the general arterial system but when it is attended by obstruction of venous flow where the arteries cross the veins we have a positive and unexceptional signal of general sclerosis with or without nephritis. By this sign obscure general symptoms will be clarified and explained and we do not have to wait for the appearance of retinal hemorrhages and exudates to diagnose a general sclerosis or a nephritis. Retinal hemorrhages and exudates are late and exceedingly serious manifestations and generally prognostically bad. They have also a differential diagnostic value. Small hemorrhages in the deeper layers of the retina are almost pathognomonic of sclerosis and are usually toxic in nature while the large anterior hemorrhages and the exudates are as a rule nephritic in origin. They accompany general dropsy, the nephritis with exudation, while the small hemorrhages, with the attending retinal sclerosis, denote the nephritis without exudation or the uncomplicated general sclerosis.

It is only lately that the value of ophthalmoscopic examination in the toxemia of pregnancy has been realized. There are cases that are renal in character and others where the source must be discovered elsewhere. Ophthalmoscopic examination when negative does not rule out the renal origin but when positive is of very great help both diagnostically and prognostically. The presence of retinal hemorrhages and exudates adds great seriousness to the prognosis for they mean profoundly affected kidneys. Again there arises the possibility of a complicating general sclerosis. This may be discovered also in the retina by the appearance of the blood vessels

and by the presence of the deep small dot-like and flame-like hemorrhages. Also in the toxemia of pregnancy the question frequently confronts us whether the renal lesion developed during gestation or was pre-existent. Here also ophthalmoscopic examination is important. A history of diminishing vision beginning before pregnancy when added to the general renal symptoms and to the discovery of retinal hemorrhages and exudates makes a pregestative diagnosis probable if not positive. This is also true when the well-marked signs of sclerosis, not necessarily hemorrhages, are apparent in the retina. Sclerosis is a slow process and when venous obstruction is discovered the sclerosis is well advanced and hypertension is already present.

Finally attention may be drawn to eclampsia and amaurosis. The latter may precede the former but not necessarily. There are many cases of eclampsia in which there are no ocular renal symptoms and likewise amaurosis may arise suddenly in which the fundus oculi is normal. In both the toxic saturation is so quick and violent that there is no time for fundus symptoms to appear. In this eclampsia and amaurosis differ from the usual renal toxemia of pregnancy. In the former there may be no preceding diminishing of vision while in the latter on account of the presence of hemorrhages and exudates, interfering with the visual fibers, gradual diminution of vision is a common accompaniment.

Diagnosis

Problems in Diagnosis from Standpoint of Ophthalmologist. In order to show the desirability of establishing a more intimate contact between the fields of general medicine and ophthalmology, especially in the matter of diagnosis, William W. Blair[2] made an analysis of 100

(2) Pennsylvania M. J., May, 1929.

cases as they appeared consecutively in his private practice. A tabulation of these cases shows the following distribution: Errors of refraction 55, cataract 17, glaucoma 7, anomalies of the ocular muscles 7, ocular injuries 4, conjunctival infections 2, anterior uveitis 4, lesions of the ocular fundus 4, total 100. Naturally, some overlapping occurred, as not a few cases showed secondary or accompanying involvement of structures other than those under which they were classified, the classification being based on the outstanding complaint in each individual case.

As was to be expected, refractive errors furnished the majority of the cases in the list. It would seem to be quite superfluous to dwell at any length upon the importance of the early recognition and correction of errors of refraction; but it is a fact that practicing ophthalmologists are being confronted almost daily with cases, particularly among children, in which the eye physician is the last to be consulted for the relief of headache, hebetude, lack of interest in school work, and a whole train of symptoms which not infrequently can be cleared up entirely by the wearing of properly selected glasses.

The passing of the visual test usually applied by the teacher, school nurse, or even the school physician, does not give complete assurance of the absence of an appreciable amount of hyperopia or hyperopic astigmatism which can be correctly estimated only with the eye under the influence of a reliable cycloplegic. It is to be further emphasized that, while eye defects among school children are, after diseased tonsils, the most prevalent of all abnormal conditions, it is among those showing little or no impairment of vision that cases of headache, mental fatigue, and apparent dullness in the schoolroom are most frequently found. It is in just this type of child, also, that ophthalmologists are able to furnish most prompt and acceptable relief. Yet the eye physician must be something more than a refractionist, as is well

illustrated by the following case, reported by James Taylor (Brit. J. Ophth., July, 1928):

"A strong, healthy-appearing lad complained of headaches. He had been seen by an oculist and a neurologist, and a diagnosis of brain tumor was made. The subsequent history showed that there was no tumor, but simply intensely conoptic disks, which condition is not infrequently seen upon ophthalmoscopic examination, and is taken at its true value by the discerning examiner."

Among the cases of refractive error was one of extreme interest:

Mrs. W. W., a rather large, healthy-appearing woman, whose refraction had been measured on numerous occasions previously, came requesting that her eyes be examined, as she was no longer able to read with her old glasses nor was she now able to see clearly at a distance. The notes on the case showed that the vision had always been recorded as normal for distance, with the normal presbyopic correction added for reading. Upon testing her now, at the six-meter distance, a plus 1.75 D. spherical was required to give normal vision. The extrinsic muscles were in good balance, and the ocular fundi were normal in appearance. These facts, together with the presence of normal vision through a glass representing a refractive error which the patient had never before exhibited, led the doctor to suspect that some radical change was taking place in her physical economy. She was, therefore, sent to an internist for a physical examination. It was not surprising to receive a report that the patient was suffering from a well-developed case of diabetes. Under a strict hospital regimen she soon became sugar-free, and within a month's time her refraction had returned to normal.

Had this patient's condition not been suggested by the very apparent change in the refractive index of her intra-ocular fluids, as represented by a rapidly acquired

hyperopia, she might have developed a condition much more serious than it was when discovered.

Among the muscular anomalies were discovered squints of the paralytic type, as well as the more common concomitant variety. Of the latter, there were several which had been neglected until the time had passed when the correction of the accompanying refractive error could be expected to restore parallelism. The usual explanation in these cases is that the parents had been advised that the child would sooner or later outgrow the defect.

One case of paralytic squint was that of a woman aged 60 years who, upon being referred to an internist for physical examination, was reported to have a positive Wassermann reaction. In this instance, a course of potassium iodid was followed by complete relief from the annoying diplopia, and ultimately by almost perfect restoration of the muscle balance.

A case of special interest was that of a clergyman who came with complete third-nerve palsy, and it was not until the condition had progressed for some weeks that an internist was able to make a diagnosis of encephalitis lethargica.

In the series there were several types of cataract, and the only comment on them which seems justifiable here is to stress the fact that cataract appears in so many forms that it is desirable to classify it accurately, in order to be able to inform the patient, with some degree of confidence, just what is to be expected as to the future development of the difficulty. Nothing is more bewildering to a patient than to be told by one physician that he is suffering from cataract and that blindness will shortly ensue, and then to be told by the next man consulted that, though the cataract is undoubtedly present, it is of a form that will probably never mature, and will never require operation. With the instruments now at our disposal, especially the slit lamp, it is possible to say with a fair degree of accuracy which cataracts are

likely to progress and which may remain stationary, and also to recognize the complicated type which, though it may go on to maturity, may never be operated upon with success.

Anterior uveitis is an inflammation involving the iris, ciliary body, and secondarily the cornea. This distressing condition arises almost invariably from an endogenous infection which has its seat in the tonsils, accessory sinuses, or at the apices of devitalized teeth, or even from a general blood-stream infection. An accurate diagnosis of the underlying condition is absolutely essential to the successful treatment of these most serious affections. Of the four cases included in this series, three were found to be due to tuberculosis, and it was only after most painstaking search on the part of the internists collaborating on these cases that the diagnosis was confirmed and appropriate treatment instituted. The point to be stressed in this connection is that, particularly in this type of case, local treatment is only palliative, and can do little towards the cure of the patient; therefore, the dentist, the rhinologist, or the internist must be looked to for real help.

Of ocular-fundus lesions, two types may be mentioned; namely, massive chorioidal exudations, and the typical form observed in patients suffering from cardiovascular involvement. The former appear usually with little or no pain, but with sudden dimness of vision, either throughout the visual field or involving but a portion of it. With the ophthalmoscope the characteristic light-yellowish elevated masses overlying the retinal vessels may be seen, usually with small, though sometimes massive, hemorrhages scattered throughout the fundus. Inflammation of this character is nearly always found to be due to some definite focus of infection, as the superior maxillary sinus, the ethmoids, or tonsils, and of course requires the elimination of said focus before recovery may be expected. Again, the ophthalmologist must play a secondary rôle, his office being to conserve the integrity

of the eye, while the surgeon carries out the chief measures for the relief of the patient.

The other type of fundus lesion referred to is exemplified by the following case history:

A man aged 47 years came for a routine examination of his eyes, thinking that his glasses needed changing. The static refraction remained the same as at the last examination, which had been made ten years before. The presbyopia had, of course, increased, but not more than was to be expected after this lapse of time. Upon examining the fundus, however, the following was found: In the right eye all the arteries showed an exaggerated light streak, with marked notches in the veins wherever they were crossed by the arteries. The latter showed marked tortuosity, and were somewhat irregular in outline. There was a small oval hemorrhage about the diameter of the disk, which was located just below the disk. In the left eye, the arteries showed an abnormally prominent light streak, but there was no definite notching of the veins. There was one small hemorrhage in the retina, about half the diameter of the disk, located just below the macula.

Here is a picture with which every ophthalmologist is familiar. So frequently are these clinical signs met with in patients at or beyond the middle period of life that we should consider ourselves negligent if every presbyopic patient is not given a searching ophthalmoscopic examination, even though the apparent need is simply a change in reading glasses. The patient just described was sent immediately to his physician for a thorough physical survey, with the result that he was found to present the typical picture of beginning nephritis, and was accordingly placed promptly on appropriate treatment.

In presenting the details of a few of the cases of the series, emphasis has been laid upon the responsibility which rests with the ophthalmologist to keep ever in mind the truth that the eye is but a part of the human

organism, that a sick eye usually means that some other part of the body is also sick, and that successful treatment of most eye conditions demands as full a knowledge as possible concerning the underlying causative conditions.

Meyer Wiener[3] states that nowhere is this interdependence of the ophthalmologist and the general practitioner more striking than in the branch of neurology. A very large proportion of the cases of brain tumors seen by the specialist in neuro surgery, is first seen and diagnosed by the ophthalmologist. Unfortunately, these cases are apt to slip by unnoticed unless a careful systematic routine of examination is maintained. In all cases of headaches, unexplained by refractive errors or muscle imbalance, careful ophthalmoscopic examination and recording of visual fields must be made before passing the patient along for further examination and study. Especially are we inclined to become careless in a case which we may have observed for a long time as a refractive case; for example, where the patient may develop an intracranial growth and the symptoms be easily ignored or misinterpreted. When a patient complains of a certain symptom, there is always some basis in fact.

In skull injuries, the ophthalmologist naturally plays an important part, as the observation of the eyes and eye grounds often indicate to the surgeon the necessity for surgical interference, and even point to the location.

Nystagmus is a condition which puzzles many. It may be hereditary which would include that due to albinism. Individuals have been known who could produce voluntary nystagmus at will. It may result from marked bilateral visual defect originating very early in life. Nystagmus occurs as a result of labyrinthine disease or as a manifestation of certain nervous disorders, such as disseminate sclerosis, syringomyelia and Friedrich's ataxia. Cerebellar lesions, inflammatory or in the nature of a neoplasm, are often associated with

(3) Illinois M. J., November, 1928.

nystagmus. Cerebral lesions do not give rise to nystagmus.

Occupational nystagmus is familiar to all. Certain facts regarding its causation are clear. It is generally agreed that in mines where it is feasible to use naked lights instead of the Davy lamps, the condition is almost unknown. It is interesting to note that a much larger proportion of miners with nystagmus are blonds.

Ciliary alopecia or madarosis is generally the result of chronic inflammatory process, but may occur spontaneously as the result of a disturbance of the endocrine system. It was seen by Wiener in a young girl during adolescence where all of the lashes and eye brows became white and finally disappeared. This child recovered completely under treatment with ovarian extract.

It must be borne in mind that acquired tumefaction of the lid may result from mucocele of the frontal sinus, whereas, if congenital, encephalocele must be considered. These are rare.

An aesthesia of the lids is present in leprosy and sometimes in the beginning of tabes. It may also be a manifestation of hysteria.

Ptosis may be due to a local inflammatory process or possibly to tabes or to a central lesion.

Color of the conjunctiva may be white and pearly as in anemia or phthisis, yellow as in icterus, or blue as in thinning of the sclera associated with brittle bones. Ecchymoses or hemorrhages in the conjunctiva, when not associated with injury, generally means, in adult life, focal infection. The vast majority of cases can be attributed to abscessed teeth. Phlyctenules or small pimples of the conjunctiva, usually on or close to the corneal margin, are held by most authorities to be tuberculous. Children affected by this disease have severe photophobia, and are usually improperly fed. Fresh air and sunshine with plenty of milk and cod liver oil with abstinence from sweets, secure the desired results.

Paralytic deviations of the globe are prone to sudden appearance and may increase rapidly in degree. They are frequently bilateral and often affect a set of muscles. They are often associated with other paralytic symptoms and are usually ushered in by diplopia and associated with vertigo. The paralysis is peripheral when the lesion is situated anywhere along the course of the nerve between its nucleus and its termination in the muscle.

Total ophthalmoplegia may be set down as peripheral, either basilar or orbital. Associated symptoms of the fifth nerve, like neuralgias and neuro-paralytic keratitis, and of the optic nerve, such as optic neuritis and optic atrophy are frequently present. If there are associated symptoms and if one notes besides these, symptoms pointing to trouble of the oblongata, the lesion may be called nuclear. These deductions refer to unilateral paralysis.

Conjugate paralysis or paralysis of the associated movements is frequently observed in disseminated sclerosis.

Exophthalmos, if not associated with a local disease of the orbit, such as trauma, hemorrhage into the orbit, phlegmon, periostitis, emphysema, or involvement of one of the adjacent sinuses, is most usually met with in Basedow's disease. With this, of course, we have the associated Graefe sign of the lids and the weakness of convergence.

One of the earliest signs of exophthalmic goiter is insufficiency of convergence, and whenever we find, in our routine examination of the eye muscles, this condition, we look for the other symptoms such as shortness of breath, tremor, moist palms, headaches and enlarged thyroid, and seek help from the general practitioner for the relief of these symptoms. One of the outstanding symptoms of a patient suffering from convergence insufficiency, is that of sleepiness during close work.

Exophthalmos may be formed from the rare growth known as chloroma, recognized by the bright green color

of the growth and its especial predilection for the bones of the skull and dura mater; and may be further confirmed by the finding of myelocytes in the tissues and blood, as in leukemia.

The cornea may vary in size and shape, but is usually about 11 mm. in diameter. Keratoconus, or conical cornea is a disease of adolescence, occurring both in the male and female and is unquestionably influenced in the early stage by the local instillations of epinephrin and the building up of the patient's general physical condition.

Every practitioner should be able to remove a foreign body from the cornea or lid. As a rule the substance lies underneath the upper lid, and can be wiped off by simply everting the upper lid. A clew to the location of a foreign body is given by the localized pericorneal injection which is always present. Opacities of the cornea may be due to scars, which would be revealed by the history as a rule, as well as by a careful examination with focal illumination. In this case there is seldom vascularization. Active infiltration of the cornea, except in the very early stages, always shows pericorneal injection. This we find due to various general disorders. The severe deep general infiltration of the cornea or interstitial keratitis is practically always syphilitic and most usually congenital.

Other signs of hereditary syphilis are seldom lacking. Other forms of infiltration or ulceration, however, are found the result of focal infection. In such cases we seek the help of the general practitioner in a careful search which must include teeth, tonsils, prostate, gall-bladder, and gastro-intestinal tract. The focus may occasionally be most unusual.

Anesthesia of the cornea is sometimes found in tabes, although it is also found in hysteria and in glaucoma. Corneal hypoesthesia is part of the syndrome sensitivo-senorial hemianesthesia and to organic lesion of the

posterior part of the capsule, or extensive cortical lesion of the parieto-occipital region.

There is one condition of the iris indicating high blood presure in arteriosclerosis, wherein the pupil is larger than usual, responds to light, but quickly rebounds to its first position.

There are a few conditions in which the pupil will respond to light even though the patient cannot see, such as found in uremic blindness, and the blindness of post-basic meningitis, and puerperal amaurosis. These conditions are supposed to be due to the effect of toxins on the visual cortex.

Primary inflammation of the iris, when not due to local causes, may result from syphilis, gonorrhea, acute infectious diseases, disorders of metabolism, such as diabetes, gout and hyperthyroidism; and tuberculosis. In many cases iritis may be due to focal infection. Needless to remark, the internist must help us in our search for the cause if we hope to effect a cure. When a case is referred to the medical man by the ophthalmologist, he should suggest to him what to look for because the eye indicates it, and the indications may otherwise be absent. Some internists are sensitive, and resent receiving suggestions from specialists who refer cases for examination. They feel that their examination should not be influenced in any manner whatsoever.

On the other hand, if the medical man, in referring a case for ophthalmologic examination, would briefly outline his own findings, our reports would undoubtedly stimulate an interest in ophthalmology for the internist and would result in increased mutual benefit.

Every condition where the cornea and iris is involved is not necessarily a limited affection of these tissues, acute congestive glaucoma, for example. In this disease, the general practitioner is often the first to be called, as the onset is usually so sudden and the pain so severe that it cannot be localized by the patient, who sends for the family doctor. Whenever you see a case

of acute severe headache accompanied by nausea and vomiting, carefully examine the eyes to exclude glaucoma. Timely treatment in the reduction of tension means everything in restoration of vision as well as permanent relief of the symptoms.

Every corneal lesion or inflammation of the iris or choroid, where an obvious cause is not evident, should be suspected of being tuberculous. The examination should be made in the patient's home or in a hospital, with the patient in bed. The examination must be made with great care as it is not without danger to the eye. Internists are accustomed to giving an initial dose of 1 mg. of Koch's old tuberculin. The author has seen 1/000 mg. produce such a terrific focal reaction in the eye of a sensitized individual as to almost result in the loss of the eye. He begins with maximum doses of 1/1000 mg. and gradually increases to 1 mg., and does not consider the case to be tuberculous unless he obtains a positive local, general and focal reaction. In the treatment he requests the physician to adminster the largest dose possible without producing a reaction.

The causes of retinal hemorrhages are many and varied. They vary greatly in number and size, in their position in the retina regarding proximity or remote position to the disk as well as the layers of the retina involved.

General arteriosclerosis is nearly always evidenced by changes in the retinal vessels, and consequently is often first discovered by the ophthalmologist. The retinal vessels can be studied in life in a manner not possible with any other vessel in the body, being magnified about 15 diameters with the direct method: The first change is an increased brightness in the retinal reflex, often termed the "copper wire" appearance. Compression of the veins where crossed by an artery is next observed. The lumen of the artery ceases to be of uniform calibre and shows narrowings in its course. The arteries become tortuous. Retinal hemorrhages occur, and white

exudates usually taking the form of white dots or spots, are found. The individual dots are rarely larger than the diameter of one of the main veins but occasionally one finds large plaques. These findings are usually bilateral but may be seen in only one eye. Where the exudates are present, especially in large and increasing numbers the prognosis is poor. In renal retinitis there is a more distinctive ophthalmoscopic appearance, it is always bilateral, and the patient generally dies within a few years.

The condition of the retinal arteries may be said to serve as a guide to the condition of the cerebral arteries and although this is true in the majority of cases, there are exceptions.

In pernicious anemia the hemorrhages are mostly flame shaped, the tendency to their formation beginning when the corpuscles have dropped to one-third. There are few patients with myelogenous leukemia who do not show retinal changes at some stage, first manifested by enlargement of the veins, sometimes the arteries; later hemorrhages, either deep or superficial, followed by a general leukocytic infiltration of the retina and choroid.

In thrombosis of the cavernous sinus a varying degree of proptosis is constantly present due to venous edema and obstruction of the orbital cellular tissues. The proptosis starts on one side but later extends to the other side from extension by means of the circular sinus. This differentiates it from orbital cellutitis. Chemosis and edema of the lids is common and a peculiar bluish color of the lids due to engorgement of the veins is quite suggestive.

Hysterical blindness can generally be determined by the fields which are usually tubular or spiral shaped. It must be borne in mind that a hysterical condition is often superimposed on some organic disease.

In disseminate sclerosis the loss of sight precedes the atrophic changes in the disk. The atrophy never becomes complete. Alternate loss of sight and recovery

may occur several times before changes in the disk can be seen. Defects in the fields are usually central and may be for colors or complete. When peripheral, they are generally irregular.

There are many conditions such as changes in brain tumor; ocular changes in dysentery, blindness from severe hemorrhage, amaurotic family idiocy, Mikulicz's disease, hemorrhage in the new-born, tobacco and alcohol amblyopia and changes in the eyes from parasites and various chemicals and drugs.

The Eyelids

The Surgical Treatment of Intractable Cases of Blepharospasm. Organic blepharospasm as such or as an expression of facial hemispasm is a condition of importance from the standpoint of treatment. The treatment depends for its success on attacking the etiologic factor involved in the production of the disease. However, there are always a few cases the etiology of which cannot be determined and which are absolutely refractory to most methods of treatment, unless heroic measures are employed.

Organic blepharospasm as such or as complicating facial spasm is a contraction of the orbicularis oculi muscle caused by organic alterations in the reflex arc between the sensory trigeminal and the motor facial nerves. Figure 1 shows this arc in a diagrammatic form. The etiology of the condition, then, may be anything that alters this arc. Diseases of the eye, of the ear, of the nose or of the cicatricial tissue on the face involving the sensory nerves, and pressure on the nerves in the middle, posterior or anterior cranial fossae have all been described as etiologic factors in the production of the disease. In late years blepharospasm has also been seen as a postencephalitic manifestation.

The disease manifests itself in attacks characterized

by a fibrillary tremor involving the orbicularis oculi muscle, which gradually increases in intensity and extent until eventually a tonic spasm occurs which causes a complete closure of the eyelids. The remaining muscles supplied by the facial nerves on the same side may be involved also. However, the blepharospasm is most noticeable by the patient and it is the complaint for which he consults the physician. It should also be mentioned that there is a distinct difference between

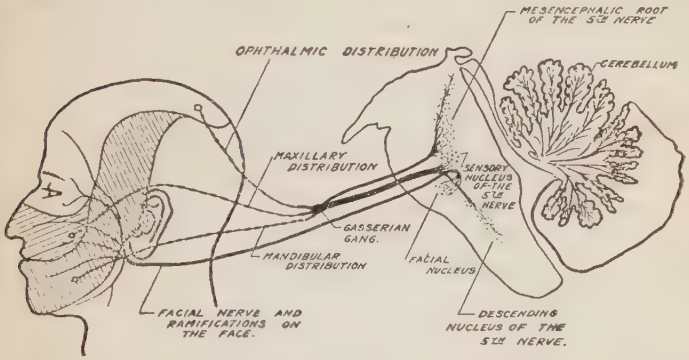


Fig. 1—Reflex arc between the sensory trigeminal and the motor facial nerves. Alterations in the arc may be caused in the distribution of the trigeminal on the face or as it passes to the middle cranial fossa and brain stem; true also of the facial nerve as it leaves the cranial cavity in the posterior fossa, and as it passes through the facial canal and on.

blepharospasm as here defined and tic (tic convulsif of the French). The latter is a manifestation of psychogenic causes and is amenable to treatment by psychotherapy and educative measures. The differential diagnosis is based on the fact that tic involves a functional group of muscles (irrespective of nerve supply), whereas spasm is concerned with anatomic grouping (group of muscles having the same nerve supply). Furthermore, the type of contraction in tics is different. The movements are more gesticulatory in nature and do not simulate the description of attacks in blepharospasm. Tic disappears during sleep and is influenced by mental states, whereas this is not true of spasm.

A patient with organic blepharospasm does get well after measures correcting the etiologic factors. However, there are always a few patients in whom the etiology cannot be determined and who have to be treated by heroic measures.

E. S. Gurdjian and Henry Ward Williams[4] report and describe the operative treatment of three cases of this intractable form of the disease. One of the three was cured by neurectomy of the upper two or three branches of the facial nerve. Alcohol injection methods alleviated the condition in the other two but did not result in complete cure. The authors state that the question of evulsing the peripheral portion of the upper two or three branches of the facial nerve in cases of postencephalitic blepharospasm is worthy of consideration for permanent cure; and that these methods should not be used except after careful study of the patient and after the conclusion has been reached that he is refractory to all types of treatment except these heroic measures.

Ankyloblepharon. Ankyloblepharon is a condition in which there is an adhesion of the eyelids along the palpebral margin, which may be partial or total. It is rarely congenital. As an acquired affection it follows ulceration, burns and other injuries. It results from the growing together of two raw surfaces.

F. H. Rodin[5] reports the case of a man 26 years of age, whose right eye had been burned with a hot iron twenty-two years previously.

Examination revealed that there was a complete cohesion of the eyelids of the right eye. A faint longitudinal depression was present where the eyelids were united together (Fig. 2). At the outer third of the adhesion a small opening, 1 mm. in diameter, was present, into which a probe could be passed for 2 mm., the movement of the probe ending in a blind pouch. A few

(4) J. A. M. A., Dec. 29, 1928.
(5) Am. J. Ophth., December, 1928.

poorly developed cilia projected from the opening, and the patient stated that tears occasionally appeared there. A shrunken eyeball was felt through the eyelids.

The case of a 73 year old farmer with a marked senile ectropion involving both lower lids, is reported by W. B. H. Waring[6]. The conjunctiva was reddened and considerably hypertrophied, and accompanied by much mucopurulent discharge. This bothered him, especially on awakening in the mornings, when his lids were heavy and matted together with the dried secretion.

He had been under treatment for some time by a

Fig. 2—Rodin's case of total ankyloblepharon due to a burn.

competent ophthalmologist, who found the ordinary medicinal treatments ineffective, and suggested operative treatment as the only way to effect a cure. He refused to have an operation. Appropriate treatment helped the conjunctivitis somewhat, but had no appreciable effect on the ectropion. A course of treatment was then adopted which produced a perfect result without operative intervention.

The hypertrophied conjunctiva was gradually brought under control with silver nitrate and copper sulphate applications; and along with this were applied radiating touches of the electrodesiccation needle to the drooping conjunctival surfaces in a fairly systematic man-

(6) Eye, Ear, Nose & Throat Monthly, February, 1929.

ner, but at irregular intervals. The results of each treatment were cleared up before a second treatment with the electrodesiccation was applied; sometimes both lids were treated at the same visit; and then again only one at a visit, alternating from one eye to the other. Each treatment produced more or less scar tissue in the lid tissues wherever the electrodesiccation was applied; and as it contracted the scar tissue gradually began to bring the lid back into proper position. As the lid began to return to its normal position, less and less electrodesiccation treatment was employed. Over-treatment

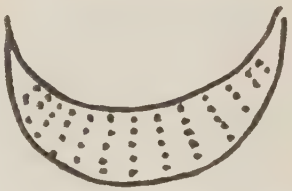


Fig. 3—Lines of electro-desiccation treatments to lids.

and over-production of scar tissue could easily defeat the object, and possibly tend to an entropion. (Fig. 3.)

The result has been perfect; and while comparatively slow as compared to operative treatment, the results have been capable of accurate regulation; and a cure effected. The suggestion is not offered as the only treatment of ectropion; or as a better treatment; merely a possibility in certain cases. Naturally any physician using this treatment, should have a good practical, working knowledge of the surgical uses of high frequency currents, along with his ophthalmological experience to guide him.

Emphysema of the Eyelids. Emphysema is a condition not frequently encountered and usually is not of great clinical significance. When encountered it means usually that some cavity has been opened up and that air has been forced into the cellular tissue or has "drained" into the cellular tissues or has followed the line of least

resistance from the forces behind it. Especially is this true with the eyelids and orbital structures. Sometimes it happens from direct violence, as fracture of the bones of the nose or ulcerative weakening of the bones of the lacrimal canal and consequent pressure from blowing the nose, etc. The air generally comes in this instance from the maxillary sinus, ethmoid cells or nasal fossa.

Several cases have been reported in literature where lid emphysema resulted from blowing the nose hard to rid it of secretions and where there had been no injury at all, so far as known, nor any surgical work done. It was thought that there might have been a diseased opening between the ethmoid cells and the orbit.

However, there may be other areas from which gas or air may come and the eyelids may be just a part of the emphysematous condition. In support of this supposition, W. E. Shastid[7] reports the following case, which is extremely rare and, on account of its rarity, worthy of mention.

A child about two or three years of age, was making marks with an ordinary long, wooden lead pencil on paper which rested on a chair. The child stumbled over a rug, fell to the floor with the pencil still in hand, the rubber end on the floor, the child's body falling heavily on the point of the pencil.

The pencil point pierced the thorax in front and made a punctured wound just barely above the first rib on the left side and below the left clavicle to the left of the manubrium of the sternum. It missed the left subclavian artery and vein but punctured the apex of the left lung. Within three minutes the left eyelid was entirely closed and in five minutes the right eye was entirely closed; the emphysema spreading to the entire face, back and entire trunk as far as the anterior spines of the ilium. Shastid saw the case within ten

(7) Illinois M. J., April, 1929.

or twelve minutes after the receipt of the injury and at first supposed the pencil had punctured the left eyeball, as the lid appeared to be worse swollen at that time, than any other tissues.

The parents quickly showed the entrance wound and gave the approximate time that the swelling of the tissues had followed those of the eyelids. During the examination the emphysema became worse and worse and the "crackling" was detected over the entire trunk. The pencil was examined and the lead point was not there; it had been broken off either before the puncture or was in the wound or lung. Several *x*-ray pictures were taken within an hour or two after the injury but were negative and to this day it is not known whether the pencil point was in the child or was broken off before the receipt of the injury. In the light of subsequent events, it would appear that probably the point was broken off before that. There was no edema of the larynx and the cough which subsequently developed was of minor importance. After the second day the eyelids began to reduce in volume and the child could see well enough with one eye to be entertained. In a week most of the emphysema was gone from the chest and back and the eyelids were beginning to look almost normal. In two weeks it was entirely gone.

Traumatic pneumonia, pleuritis, septic infection of the wound, or possibly some other complications were feared, but happily not one of these developed. The child had a little fever on several occasions but that subsided promptly and the cough before mentioned was at no time any worse than a "common cold." A punctured wound of the thorax with a dirty lead pencil into lung tissue is bad enough to warrant many misgivings but sterile dressings seemed to be all sufficient in this case and the policy was one of expectant readiness to deal with complications as they arose. The child made an uneventful recovery.

Lid Repair. Two cases of lid repair are described and illustrated by S. Hanford McKee[8]. The first case is that of a man of 54 years who complained of discomfort of the left eye due to pain and epiphora. The history was that the lid condition followed an accident sustained three months previously, when in falling on a concrete floor his glasses were broken and the upper and lower lids cut. The injured lids were sutured at

Fig. 4—Case 1. Original injury.

that time, and while the injury in the upper lid was completely corrected, there remained a troublesome ectropion at the outer side of the left lower lid due to contraction from scar tissue.

Examination showed a V-shaped area of scar tissue, involving about the outer quarter of the left lower lid margin, and causing an ectropion at the inner side

(8) Canadian M. A. J., May, 1929.

of this scar. He complained of the annoyance caused by tears running over the cheek.

Under a general anesthetic, the scar tissue was excised, and an incision made parallel to the lid margin at its outer border for about three-quarters of an inch. The skin and subcutaneous tissues were under-cut on either side until the edge of the lid was so free that it went properly back into place. A Thiersch graft was

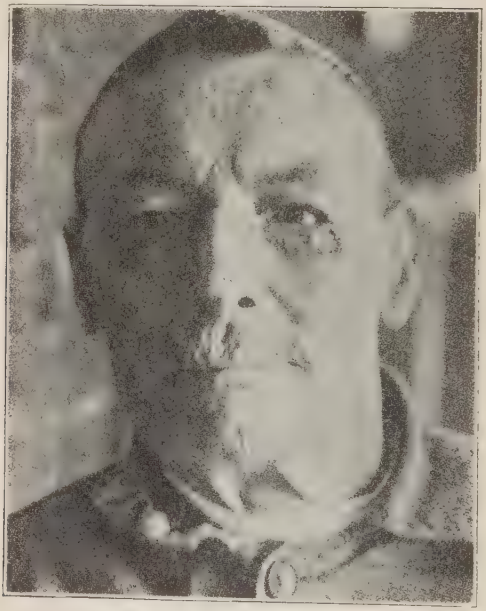


Fig. 5—Case 1. Cavity left by removal of the compound.

then taken from the left upper arm, wrapped about a piece of dental compound, and placed in the cavity made. It was held in position by three sutures. On the sixth day following the operation, the compound was removed and a dry dressing applied. When the compound was removed there was naturally quite a cavity left. It is well to understand that these cavities dis-

appear in a short time, leaving the repaired surface quite flat. This shows well in Figures 4, 5 and 6.

The second case was that of a 46-year-old man, a subject of acromegaly with glycosuria and hyperglycemia. Following a burn on the face, he had suffered from scar contracture of the skin of the lid. This was so severe that he was unable to close his eye without everting the remains of the lid almost completely. Examination showed extensive scarring of the face, with

Fig. 6—Case 1. Final result.

marked ectropion of the left upper lid, leaving the eyeball quite unprotected.

As protection of the eyeball was the first consideration, and cosmetic results secondary, under a general anesthetic a free incision was made along the border of the remains of the upper lid from one end to the other, to insure complete covering of the eye. The skin was undercut and so freed that the eyeball was completely covered. This was in fact overdone to allow for wrinkling. A piece of dental compound was then shaped so that it fitted exactly to the raw surface pre-

Fig. 7—Case 2. Original injury.

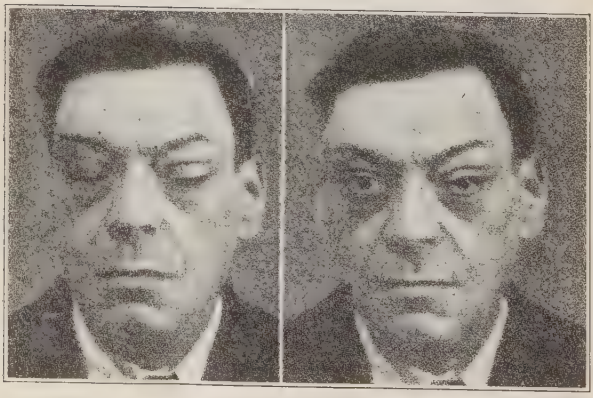


Fig. 8—Left: Case 2: The eyeball completely covered by new lid.
Fig. 9—Right: Final result.

pared. A Thiersch graft was then taken from his left upper arm, wrapped about the compound and placed on the prepared surface where it was held by six sutures. The compound was removed on the sixth day. (Figs. 7, 8, and 9.)

Eyelashes of Children. Interesting studies on children's eyelashes have been published by Tamaoki in the pediatrics department of the Kyushu Imperial University[9]. He has made studies of 7,000 children over a period of two years, and has come to these conclusions: 1. Most children with long eyelashes are in poor health. 2. The eyelashes of healthy children, which are 0.4 cm. long a month after birth, will grow to 0.65 cm. during the year, while those of scrofulous children will grow to a length of 0.85 cm. in the same period. 3. Those of consumptive children will grow twice as long in comparison with those of children in good health. 4. Children in poor health have longer and prettier eyelashes than those in good health.

Examination of the Eye

School Eye Surveys: Grammar School Report. Methods of examination of school children should be checked from time to time and an unprejudiced opinion given as to their efficacy and value in the recognition of ocular disease and of abnormalities of structure and function. School boards are importuned from all sides to allow extremists of all kinds to introduce their peculiar methods of examination and treatment into our schools, and it is worth while to determine to what extent that pressure for the introduction of unusual and unproven methods is the result of defects of our present system, or merely a desire on the part of irregular groups for self-aggrandizement at the expense of our school children.

(9) J. A. M. A., August, 1929.

In an examination of 566 school children between six and twelve years of age, Lloyd Mills[1], in addition to the usual tests for visual acuity, made tests for determining the master eye, which in actual practice have proven of great value, not only in showing which eye is dominant, but in eliciting the convergence near point, the pupillary action, and in giving a gross but practically an excellent check upon the presence of ocular muscle normality or of convergence or divergence excess. This test, while not exact in occasional instances, has been checked upon by measurements with the phoroptometer in over twenty thousand examinations and, in the main, gives an accurate index of the presence of esophoria or exophoria, if in any way excessive.

This test, as used in this survey, consists in having the child face the examiner, whose back is toward the light. A plane mirror is placed midway between the eyes and about six inches distant and is steadily and fairly rapidly brought toward the eyes, the child fixing the aperture. Normally, in the adult, the master eye maintains undeviating convergence upon this aperture while the nonfixing eye diverges at about two inches from the eyes. Children, especially younger children with their abundance of convergence power, brought into play by their interest in any new procedure, quickly get the trick of maintaining fixation to an extreme degree of approximation of the test object. To prevent this the object suddenly is put in place before them at a distance not greater than six inches and, if divergence does not occur during the test, the mirror is held in place for a few seconds until one eye yields. If this does not occur the mirror is reversed and the aperture in the dull back is presented for fixation. At times the interest which these children show is so great that they have to be cautioned to relax, to stop straining, and to merely look at the hole instead of endeavoring to see through it. In a small but definite proportion of cases,

(1) California and West. Med., March, 1929.

practically all of which are esophoric, ocular dominance must be determined by estimation of the cyclophoria with the Maddox rod and other special measures, the nonfixing eye being subject to the greater torsion.

It is of interest to note that, in general, the master eye had the better visual acuity in hyperopia and the poorer visual acuity in myopia, a condition noted previously with regard to ocular dominance. The right eye was the master eye in 391 children (69.1 per cent). The left eye was the master in 137 (24.3 per cent). No mastery was acertained in 38 children because of excessive adduction in 31 (5.3 per cent) and abduction in 7 (1.2 per cent).

As experienced physicians we have seen too many cases of ocular dysfunction due to local and general disease, and as surgeons we have noted the congenital faults of tendon insertion and of muscle structure which no amount of treatment short of surgery could ever modify to any practical extent. There is no substitute for a medically trained mind in the treatment of disease. If persons cannot qualify to the high standards of the medical profession they have no moral right to attempt to apply inferior and ineffective substitutes, designed to overcome their educational and professional handicaps, and especially in connection with our school children.

It should be stated with emphasis that there is no substitute for retinoscopy under complete mydriasis in any doubtful refractive or ocular muscular condition. The numberless measures introduced as substitutes for this scientific procedure, such as those mentioned above, fully confirm this statement,

It was noted that 7.2 per cent of the children examined had symptoms, while 26.3 per cent had some form of ocular muscle imbalance. It was noted that there was a decided relation between defective visual acuity and muscular defects, this relation being present in 52 out of 83 cases referred for more definite ex-

amination. It may be considered as a practical point that a reduction in visual acuity is associated with defective muscular function either as cause or effect. Experience shows that relief of the visual defect nearly always brings relief to muscular overeffort or undereffort, and it is worthy of note here that no system of treatment by prism or other exercise will keep the visual mechanism in permanent good function without correction of the underlying visual fault.

It is of possible significance that five out of six very poor writers, chosen at random, were crossed dextrals, *i.e.* were born to have left-sided mastery, but were converted to a right manuality with or without their parents' knowledge. This conversion should never be done intentionally without medical supervision.

A remarkably thorough study of eye conditions among school children has been recently completed by the United States Public Health Service[2] with findings of marked significance. Complete acuity and refractory examinations were made of 1860 white school children 6 to 16 years old. The group was not selected but taken as they came, hence the conclusions of the survey have a measure of validity in application to other American cities.

It is worth noting that the report of this survey is in striking contrast with the oft-quoted statement that 12 per cent of American school children have defective vision. The actual percentage found among these Washington children was several times larger than that. Simple acuity test showed 34 per cent defective and, with accommodation neutralized, 45 per cent were found to require glasses for school work.

A result of importance which cannot be too strongly emphasized was the fact that a simple acuity test, without neutralizing the accommodation, disclosed only a fraction of the serious defects. This undoubtedly is something that should be drilled into parents and school

(2) J. Missouri M. A., October, 1928.

teachers. Nearsightedness nearly always was shown up by tests with the simple Snellen chart, but far-sightedness was not. The Public Health Service pointed out that for this reason, if no other, the eyes should be examined only by a physician because optometrists, opticians and others are not legally empowered to use "drops" in the eyes to arrest accommodation.

Hyperopia was by far the most common defect, showing in 63 per cent of the children examined. Myopia affected 5.5 per cent and astigmatism 28 per cent. These included even slight defects, but 45 per cent of the children, as told above, needed immediate correction.

Nearly a fourth of those who were indicated to have standard vision or better before accommodation was suspended had only 30 per cent vision or worse after accommodation was inhibited. Seven per cent had 40 per cent or less "before," and 43 per cent, or six times that many, had 40 per cent or worse "after." Many of those in the group between standard and 75 per cent vision "before" droped to only 20 per cent vision when the hidden defects were brought out by arresting accommodation.

Another result to bear in mind was evidence that myopia tends to increase rather sharply between the seventh and twelfth years. Careful observation should be kept on children to detect the beginning and growth of short-sightedness in this period. For this reason Surgeon General Cumming urged examination of school children at least twice a year.

This survey demonstrates that not merely 12 but probably as much as 40 per cent of school children require some visual correction.

Theodore Whittington[3], who has notes of 4186 children on whom routine examination have been made, states that it cannot be too strongly insisted that the mere reading of lines of type should never be the sum total of "sight-testing."

(3) Brit. M. J., Nov. 24, 1928.

There are several factors peculiar to childhood which make a routine examination advisable. These factors ought to be more appreciated by the medical and teaching professions. Young children seldom complain of their sight. They know no better. Eyestrain and the mental fatigue produced thereby are supposed to be part of the irksomeness of doing lessons. A child's character, health, and habits are liable to be affected by its sight. The "beautiful little needle-woman" or the "wonderfully studious boy" may be the result of short sight. The child who does not see across the room clearly, and who can scarcely see at all down the street, has few distractions from his books and toys. Such children who are taught in home schools, preparatory schools, or by governesses do not get noted as do the children in the large classrooms of the schools where a blackboard is in daily use. There is much need for propaganda on this matter. So, too, a rebellious hatred of lessons or so-called stupidity may be the result of a serious defect of vision. In order to read, a young child has to see every single letter, and this at a time when the eye is not fully developed, is still growing, and is ordinarily long-sighted. Children with their great power of accommodation may, for a time at any rate, disguise a big defect, and such children will pass an examination which merely depends on the reading of test types.

As well as the growth of the eyes, we have to remember the development of their functions. Binocular vision, or bifoveate vision, should become well established within the first few years of life, but this faculty, in association with the proper muscle balance of the eyes, has to be acquired. Like walking, it is easily upset or retarded in infancy.

Variations from the normal, therefore, as regards fixation, muscle balance, and binocular vision, are the most important clews which lead us to discover defects of vision in early childhood. From this it follows that there shall have to be a distinction between the spurious

squint of the young infant and the incipient squint of the older child. From clinical experience is known the importance of early treatment; after the seventh or eighth year treatment of such defects often fails in the desired result, which is to obtain complete binocular vision. All these facts should be borne in mind and also the general medical knowledge of children not forgotten. In this way the examination by an ophthalmic surgeon may not infrequently be the starting point of great improvement in the child's health, mental and physical.

Certain simple details of a routine examination carried out on these lines may possibly be of help to some. The examination should be made in a large room which can be easily and quickly darkened. Good daylight is only needed at the place where the surgeon and child sit. Test types are artificially illuminated by standard illumination, using daylight lamps. When a number of children are to be seen, the brighter and older ones are first examined, while the others observe the proceedings without, however, being able to see the test objects. The child is seated to the left of the examiner, and behind the child is a lamp for retinoscopy. The child is allowed time to get accustomed to the surgeon's presence while the latter enters details. The surgeon then rapidly looks for external signs of inflammation, etc. The lids are carefully examined. Definite blepharitis is, of course, well known to be a suspicious sign of eyestrain, and the cleaner the child the more suspicious is this sign. The presence of quite inconspicuous scales at the roots of the eyelashes, apart from any redness, is quite as important, and more often than not indicates an error of refraction requiring treatment. The condition is a slight seborrhea due to oversecretion, the result of reflex irritation produced by eyestrain. The presence of follicles inside the lower lid makes the examiner suspect the general health or hygiene.

Next, the movements of the eyes are tried. With small children the retinoscope mirror rarely fails to at-

tract, and for a screen to cover one or the other eye the examiner uses the thumb of his left hand placed on the child's head. During the various movements of the eyes, opacities of the cornea or in the pupil area should be noted. If the lids, fixation, convergence, and other movements and muscle balance, as tried by the above methods, all appear normal and the cornea and pupil areas are clear, the child, being an infant, has passed the test.

In slightly older children, the toddlers of 3 and 4 years, the vision is further tested by pictures of familiar objects. Little children will whisper the names to a friendly examiner as the pictures are pointed out by a nurse. If the child is reading—if one may so describe it—the pictures well, each eye singly may be tried. Other children who can scarcely be persuaded to read the pictures have the eyes alternately covered. If the child dislikes having one eye covered and does not mind the other eye being covered, this latter eye should be suspected of being defective. Other things being normal, at this age no further test of each eye separately is necessary. Such pictures are not drawn to exact scale like those of Snellen's type and the "E" test, but a small child who "reads" the smaller objects freely and easily has sufficiently good vision for his age. No preliminary training is required and there is very little mental fatigue. A picture book may be first shown to the child to encourage him to talk, and then he should be told to look in the distance.

Although high myopia is relatively rare in infancy, anyone who does much children's eye work not infrequently meets with it. The author has notes of many cases of high myopia in early childhood, the worst case being of 14 D. in a child a year and nine months old.

If a child does not read these pictures, retinoscopy is immediately done and the position of the corneal reflex is noted. The room is darkened and the child looks into the distance over the examiner's shoulder at a nurse

whose duty it is to attract its attention. Children with obvious errors are at once spotted, and, together with doubtful ones, are referred to retinoscopy under a mydriatic. A young child may have 3 or 4 D. of hypermetropia at 4 years of age and have no need of treatment if it has passed these tests. Allowance must be made for the fact that although the young child is normally somewhat hypermetropic, yet at the same time he is endowed with compensatory powers of accommodation. If, however, binocular vision appears to be defective, a child with as little as 2 D. of hypermetropia may need to have this corrected. Children who can read go through all the above tests, but are examined by Snellen's test types.

In all cases note *how* they read as much as *what* they read. For example, a boy of 8 read $\frac{6}{6}$ with each eye singly, but after $\frac{6}{18}$ the reading got slower and more deliberate, and the boy shut his eyes at intervals. It had been previously noted that he had a few scales at the roots of the eyelashes. He had 2.5 D. of manifest hypermetropia. Another boy saw $\frac{6}{6}$ with each eye, but read the last few lines slowly and deliberately. He stated that his eyes troubled him when reading. Retinoscopy showed 5 D. of hypermetropia. Both these children would have passed the test if the mere reading of the type had been the only standard. Besides slowness and deliberateness and a strained attitude, the examiner should note whether the child stops reading, shuts the eyes and starts off again; also whether he screws the lids up, and, if so, should tell him to open wide and try if he can still see well.

The reputation of the examiner will suffer if he limits his examination to the correction of half a dioptre of hypermetropia in an individual with 14 D. of accommodation. It will be enhanced by the explanation that glasses are not necessary, and by the subsequent improvement in the child's health.

Moving Pictures in the Teaching of Ophthalmic Surgery. Operative work before an entire class is often a waste of time and effort, from an educational standpoint. It is spectacular but far from convincing. It is well known that a satisfactory view of any eye operation can be obtained by a very few—four to six men at the outside. How many times in a crowded operating room it has been a disappointment trying to follow the technic of some experienced operator, due to somebody's head projecting into the field of vision at the most critical stage of the operation. It would seem, therefore, that this period could be more advantageously devoted to the projection of moving pictures of operations than to actual operative work. The entire class can then follow the operation with little difficulty.

Charles E. G. Shannon[4] explains the technic and tells some of the difficulties met with in introducing this new method of instruction at Jefferson. The necessity of taking the pictures at exactly twelve inches in order to have them show the proper details brought its trials. The position of the camera directly above the head of the patient was finally accomplished through the construction of a firm floor-stand, having as its essential feature an arm placed at right angles, the distal extremity of which supported the bed on which the camera was placed. By means of a gear track, the camera can be moved vertically or horizontally, which is a decided advantage. This stand was adopted after the ordinary tripod was found to be altogether inadequate for the purpose. The latter necessitated pictures being taken at an oblique angle, and the operator's fingers frequently obstructed the field of operation, producing shadows. Even with the camera directly over the eye, this difficulty is not always overcome.

Furthermore, during the operation, the distance between the lens and the eye should be frequently measured, as it is not unusual for a patient to move his

(4) Pennsylvania M J., April, 1929.

head out of position from time to time. Sand bags placed on either side of the head to secure fixation and proper centering of the eye obviate this difficulty to a great extent. For the purpose of measurement a sliding rod has been designed the exact length of which, when extended, is 11¾ inches. This rod provides a leeway of ¼ inch, which, by experience, can be determined with fair accuracy. Notwithstanding most careful preparations, exasperating accidents frequently occur, either in the way of the light being misplaced, the patient moving out of position, or the film giving out, often at the most critical stage of the operation. However, time and experience will develop a greater degree of perfection in the mechanism.

For those who are interested, Shannon states that they employ the Bell-Howell camera (16-millimeter) with a speed of 16 pictures per second—normal speed. Slow moving pictures were found unsatisfactory. The size of the diaphragm depends naturally on the intensity of the light. They use a Kirby spotlight, supplemented by the Hammer hand light. These two lights produce a fairly strong illumination and thereby advantageously reduce the size of the diaphragm, giving a better perspective. The Kirby light gives a larger field of illumination, but produces rather intense heat. The panchromatic film gives a grayish reflex of the blood which is decidedly advantageous, as with the orthochromatic film, the blood shows up an intense black and interferes with the detailed view of the picture.

The Hammer lamp is furnished with a small 50-candle-power twenty-four-volt Nitra lamp, using a rheostat to reduce the voltage. This lamp is mounted on a stand, or may be provided with a handle for hand use. It gives a uniformly bright circular path of light of a diameter ranging from 4 to 9 cm. It is essential that the lamp be placed at a definite distance to secure adequate lighting without producing blinking or a glare uncomfortable to the patient. The Kirby lamp is

placed three feet from the site of operation, whereas the Hammer lamp is used at eighteen inches.

While the 35-millimeter, or so-called professional moving-picture camera, may have certain advantages, yet the 16-millimeter camera is much easier to handle and less expensive, and the results obtained with it are wholly adequate for all teaching purposes.

Refraction of the Eye

The Five Minute Angle as a General Formula for Recording Visual Acuity. When in 1862 Professor Snellen of Utrecht gave to ophthalmology a practical method of determining visual acuity, his purpose was largely to enable such variations as might occur to be recorded with scientific exactitude. It is well known that the smallest angle that can be perceived by the retinal elements is one that forms an image covering two cones. The smallest visual angle for black lines on a white surface is 52 seconds, but Snellen took the average of visual power as measured by an angle subtending 1 minute. The test letters which he devised form squares, each member of the letter subtending an angle of 1 minute and the entire letter an angle of 5 minutes. The formula that was employed to indicate the visual acuity was: V equals d/D, the V standing for visus, small d the distance at which the test object is placed, and the capital D the distance at which it ought to be seen when placed above the type. In order that these factors might be differentiated, the Arabic figures were used above the line and the Roman letters were placed below it; thus V equal 20/xx. This formula will be found in all the writings of the earlier ophthalmologists.

At the beginning of the present century a new element was introduced. Industry undertook to assume a degree of responsibility for the injuries sustained by

employees while engaged in the pursuit of their labors. This was met by the payment of indemnities graduated in accordance with the visual losses. In order that the exact amount of loss sustained might be clearly specified, the courts required examiners to express in terms of percentages the loss sustained in each individual case. The ophthalmologist was required to interpret his visual readings in proportionate parts of 100 per cent, which was taken as a standard value in normal vision. Meanwhile complications in the methods of record had arisen. It was found simpler to use arabic figures both above and below the line, so that what in the earlier forms was clearly indicated by the double system of notation became confused in the minds of many into a fraction; 20/20 was the same apparently as 20/xx and if 20/20 indicated normal vision, 20/40 it would seem must be half of normal vision or half sight, and half sight is another way of expressing the fact that the person examined is half blind. The absurdity of this conclusion is at once apparent to the practical refractionist; not so, however, to even the educated layman. Especially was this true in some of the courts in which this unwarranted claim received medical support.

Happily, after much labor, special committees appointed by the section on ophthalmology of the American Medical Association, by the Academy of Ophthalmology and Oto-Laryngology and by the American Ophthalmological Society agreed on a working schedule under which the percentages of visual loss were more equitably proportioned.

The difficulty still persists, however, of making clear to those who are not familiar with visual tests that the terms used in indicating visual acuity are not actual fractions. F. Park Lewis* has shown elsewhere the difficulty lies in the attempt to divide a physical function into fractional parts, and this author goes on to say that it is a law of physics that in order that the propor-

(*) J. A. M. A., Sept. 28, 1929.

tionate parts of a thing may be determined, the thing must itself be complete. There is no complete range of vision. It extends from the eye of the observer to infinity. It has one end in the mind of the observer, the other in the object seen, whatever may be its distance. One may, however, predicate a condition in which sight may be measured between definite limits. Any two points may be assumed in the entire visual range as those between which these measurements may be taken. Let the first be at a distance of 20 feet from the observer, with the object giving a visual angle of 5 minutes, and the other at a distance of 200 feet, which gives the same angle. Now if the object which should be seen at 200 feet can be seen only at 20, there is an angle of 55 minutes. It may then be said that between normal vision or that seen at 20 feet and that which would require an angle of 55 minutes at 200 feet, which in many courts is taken as that of economic blindness, there are two limits to the scale. This gives two ends from which to measure the gradations of visual losses.

If, then, a 5 minute angle or that made by correctly formed test objects at 20 feet indicates normal vision, that at 100 feet or 200 feet or 220 feet or at whatever point may be determined on as the limit beyond which further loss cannot be economically sustained, there are two ends of a scale which is subject to as many divisions as one may care to make. If the visual angle is considered as an arc of a circle, any greater angle than that of 5 minutes can be proportionately measured on the arc and the proportion definitely recorded. It would make no difference whether the test object was measured in English feet or in meters so long as the 5 minute angle was maintained at the specified distance. To record the visual test, therefore, in visual angles rather than in accordance with the Snellen formula would be simple and scientific and would take from it the confusion that now exists. Our present test letters or symbols do not readily lend themselves to any degree of

regularity in proportionate values. They are exceedingly inconvenient in determining relative percentages. When the first four lines of the usual chart are taken, the proportionate differences are relatively close. The

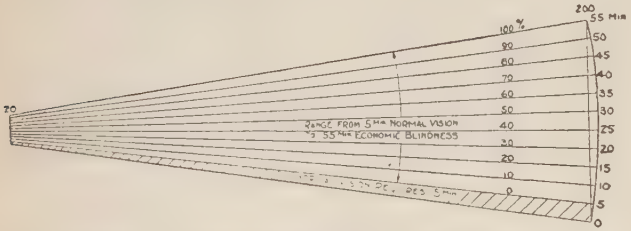


Fig. 10—Chart 1: Visual acuity should be read in minute angles rather than in fractions, as is now done.

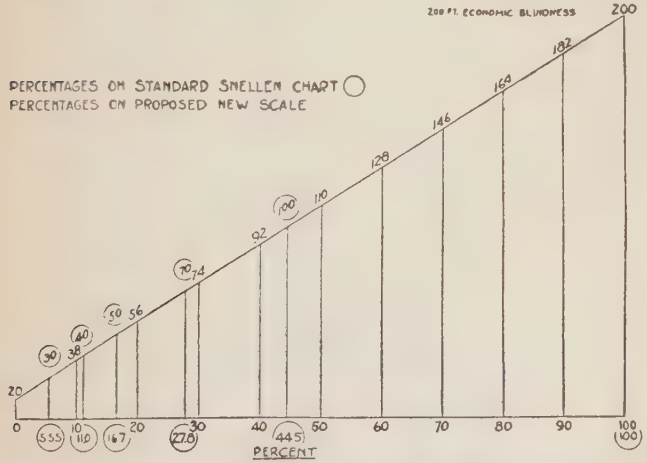


Fig. 11—Chart 2: Percentages of visual losses as given on the Snellen card as compared with the proposed test chart, the latter showing decimal gradation.

average is about 5 per cent. Between the fifty case letters and the seventy case letters is a difference of 9 per cent, while between the seventy and 100 case letters there is a difference of more than 59.5 per cent.

While it is true that the differences between the larger letters are less consequential than between the smaller ones, a single line may be sufficient to disqualify a claimant from receiving the full indemnity for economic blindness to which he is entitled, or it may give him a much greater sum than that which he should justly receive. It will be necessary, therefore, if the system of recording visual acuity in 5 minute angles is adopted, that there be constructed a test chart for letters differing in size from those ordinarily employed. The accompanying table will make this apparent. (Figs. 10 and 11).

*Standard Snellen Chart Letters and Proposed Letters**

Standard Snellen Chart Letters		Proposed Letters	
Distance of Letters	Percentage of Visual Loss	Distance of Letters	Percentage of Visual Loss
20	0	20	0
30	5.55	29	5
40	11.1	38	10
50	16.7	47	15
70	27.8	56	20
100	44.5	74	30
200	100	92	40
		110	50
		128	60
		146	70
		164	80
		182	90
		200	100

*If letters are made to be read at the distances indicated on the proposed chart rather than those on the Snellen chart, the results may be read in decimal percentages.

It would seem, however, that a test chart could be constructed with great readiness which would give values in a regularly progressive percentage series. In the table shown the first column would represent the usual size of the Snellen letters with the irregular percentages; the second would represent an irregular size of the letters with exact percentages.

While the percentage values are the same, it will be

evident that the percentages in the first column are awkwardly fractioned and unevenly arranged but with exact decimal percentages. In both instances the size of the letters is near enough to give an exact and scientific basis of record. The distance at which the proposed letters should be read in order that they may give a 5 minute angle is as shown, and the percentages in the proposed chart are based on the following equation:

$$\frac{(C - 20)}{180} \times 100 \text{ equals percentage of visual loss.}$$

Now if the arc represents a loss of 50 minutes greater than the 5 minute angle of normal sight, the readiness with which this may be divided into ten or if necessary twenty parts is apparent (chart 1).

In its practical application a 5 minute difference is sufficient except for the first four lines. The range between letters which should be seen at 20 and 36 feet is too great, as is that between 36 and 56. This is met by using the 2.5 minute angle instead of the 5 and thereby giving intervening letters for 29 and 47, which makes a scale of test objects giving intervals of 2.5 minute angles for the first four and 5 minute angles for the remainder of the series.

The mere reading of the letters then gives at once the percentage of losses, so that no calculations are necessary. It will be found that this is more simple, less confusing, and fully as scientific as the system of notation now employed.

The Causation of Myopia. Many have been the theories put forward to account for shortsightedness in children, a condition in which for some reason the sclerotic is unduly stretched during the early years of life, so that accurate focussing demands the use of concave lenses. Sir Arthur Keith[5], a few years ago, described myopia as a disorder of growth, and attributed it to a faulty reaction of the fibroblasts of the sclerotic to the

(5) Lancet, Dec. 29, 1928.

strain they are subjected to arising from intra-ocular pressure during the period of growth. This no doubt is a true way of stating a fact, and heredity, which in certain families is very prominent, has undoubtedly much to do with the defect in the process of growth. But though this hereditary defect may exist as a primary cause in all myopes and in some way be of such importance as to put other causes into the shade, it by no means follows that other causes should be ignored. The constant wearing of accurately prescribed glasses undoubtedly appears to have a favorable influence in retarding the process by lessening strain. On the other hand, prolonged convergence of the eyes in near work has been stated to involve an increase of pressure by the external muscles of the eye and especially by the superior oblique. This increase of pressure, however, has never been actually proven.

Venous engorgement is now regarded as a more probable cause, and such engorgement may result from prolonged stooping of the head and neck, such as work at short range entails. Levinson laid stress on this factor twenty years ago, and since then has reinforced his opinion by keeping young apes in a horizontal position. He claims that by doing so he not only renders them myopic but produces changes in the fundi similar to those found in human myopes.

The proportion of animals in whom myopia was artificially developed (70 per cent) contrasts with the 16 per cent in whom myopia is said to be normally present. In two of the animals a myopic crescent was also produced. The typical myopic crescent, while no proof of active myopia, is not a congenital defect, but is at present regarded as the result of a stretching of the eyeball during growth, and in consequence is frequently met with in myopes.

Prolonged stooping of the head and neck over work at short range is very common in school children, and teachers and parents should be directed to watch chil-

dren and prevent them taking this very injurious position while working at their lessons.

Advances in understanding what myopia is have been held back because of the many mechanical explanations with promiscuous prescribing of glasses, assuming refraction as the cause with its associated near work.

Von Graefe at one time stated that myopia was a definite sclerico-choroiditis, admitting thereby that inflammation and pathological changes were the cause. He deserted his original opinion because the microscopist was unable to find inflammatory changes in the incipient myopic eye and the subsequent changes were charged to pulling and stretching of the globe of the eye by intrinsic or extrinsic causes. It was unfortunate that he did not recognize that we had not sufficiently progresed in diseased histology to be able to detect microscopically a diseased condition, which, however, is present.

T. J. Dimitry[6] emphasizes the importance of recognizing the fact that the eyes are part of the whole body and bodily ailments do affect the eyes. Statistics are of little value in myopia if they do not rigidly consider the bodily condition of the myopic patient for an explanation of the cause. Few diseases of the eye are primary per se and myopia is one in which the health of the body is an essential factor in its cause. The opinions of others are cited in support of this contention: Parsons states that myopia is entirely congenital, while the higher grades have in addition a truly inflammatory factor. He further states that there is no denying that inflammatory changes are to be noticed in the fundus of the eye. Donders says that near work cannot be the sole cause for it is found among people who rarely use their eyes in this manner. Manthner voices predisposition to a weakened tissue. Lange says that the elastic fibres of the sclera are deficient. Horner claims the high myope to be ill nourished and anemic. Stilling made the same observation. Schon states that scleritis is always

(6) New Orleans M. & S. J., December, 1928.

accompanied by choroiditis and it is not improbable that the converse can occur and that both are due to an annular scleritis. Donders in 1866 stated that myopia is a veritable disease. Hirschberg prescribes cod liver oil for the recognized anemic patients with myopia. He states that he adopts the plan of treating the body rather than the disease. Arganorez claims it is due to disturbance of internal secretion and clinical examination has revealed the existence of heredo-syphilis. Edridge-Green never has seen a case of myopia which was caused by near work. Elschnig says that the progress of myopia may be checked by improving the general health and treating heredo-syphilis. Lamare suggests the nasal sinuses as a factor in weakening the sclera in the production of myopia. Hirsch sees a close parallelism substantiating his theory that the toxins of tuberculosis give rise to myopia. Peter would direct his efforts against lowered bodily health in myopia. Koster definitely charges the cause of all forms of myopia to a pathological condition which is generally inherited chorioretinitis.

The author believes that mechanical factors are only contributory and these mechanical factors would have no effect upon a healthy resisting sclera.

A study of myopia is the investigation of health itself.

The body harbors the factor productive of the condition and we should not be neglectful of certain bodily constituents which give strength to tissue, and which are found lacking in dietary deficiency diseases. It must be remembered that the sclera bulges because it is weak and has lost its power of elasticity.

The Lens Capsule and Accommodation. Although abundant evidence is now available in suport of the general principle of Helmholtz's theory of accommodation. no definite explanation had been given of the formation of the "lenticonus" discovered by Tscherning, which led him to challenge that theory. E. T. Fincham[7] sug-

(7) Brit. M. J., Feb. 9, 1929.

gests that the varying thickness of the capsule covering the anterior surface of the lens would account for the type of surface which Tscherning had depicted. This writer described the determination of the form of the anterior surface of the lenses of freshly dead animals, by photographic records of the image reflected from the surface. The lenses of a number of different species were examined and records were made when the lens was held under tension by its normal suspensions and also when the suspensions were removed. The thickness of the capsule in each case was then measured microscopically. The results showed that in primates the anterior surface of the lens assumed a somewhat conical form with an area of increased curvature in the center, when the suspensions were severed. The capsule of the primate lens had a zone of increased thickness surrounding a central thin area. Photographs of the profile view of a monkey's lens, which was removed from the eye and suspended in oil, revealed it in the typical accommodated form. A similar view of the lens without its capsule showed a close approach to the unaccommodated form. The anterior lens capsule of animals of an order lower than the primates was found to be approximately uniform in thickness. The "lenticonus" was not found in these cases, and the removal of the capsule did not cause an appreciable change in the form of the lens. From these findings the theory was formulated that accommodation consisted of a relaxation of tension upon the lens by the contraction of the ciliary muscle as stated by Helmholtz. This relaxation allowed the capsule to press upon the lens substance and mold it into the accommodated form. In the unaccommodated state the tension under which the lens was held by its supporting fibres did not permit this compression. The unaccommodated lens substance was therefore in its unrestricted or natural form and not under compression as supposed in the Helmholtz theory.

The Ocular Muscles

Heterophoria. In a discussion on heterophoria at the British Ophthalmological Congress in April, 1929, E. E. Maddox[8] stated that the discomfort arising from this condition was apt to hover about the occipital region, whereas that of refractive errors was felt at the back of the eye, in the temples and the brow.

Sometimes a wandering eye suppressed its vision instantaneously, so that no diplopia appeared; but, even so, the suppression made no difference to the effect of the wandering on the aim of the other eye. With regard to the treatment of heterophoria, Maddox said it was impossible to make rigid rules, as it was a symptom, not a disease. The person must be treated, not the phenomenon. Most minor heterophorias did not need treatment, though exceptions could be admitted in the cases of aviators, sportsmen, and others, as it might have importance when the nervous system was tired. Errors of refraction were by far the most common cause, but septic foci in nose, teeth or tonsils, lack of fresh air and exercise, and anemia could not be left out of account. If refraction treatment failed, the choice lay between exercises or relieving prisms. The former were more suitable for the young, prisms for the old. Any neurasthenia should be treated first. The effective value of a prism was less at reading distance than for a far object. Also, one must make sure that the hyperphoria was not an after-effect of wearing spectacles askew. If present only with the spectacles on, the fault lay with the glasses; if vice versa, the fault which had been in the spectacles was transferred to the eye. Or the patient might have skewed his spectacles to correct it. For esophoria, prisms were less useful than lenses; the latter were curative. In exophoria, constitutional treatment was more often needed than in the other varieties; it was also the most suitable for training, especially where

(8) Lancet, April, 1929.

there was subconvergence. Weak prisms were often helpful; strong ones caused metamorphopsia, robbing the accommodation of the support it was accustomed to receive from convergence. Operations were very suitable in selected cases of heterophoria; in neurotic people their effect was not permanent.

The Early Treatment of Strabismus. There seems to be a prevalent idea among the laity, and to a large degree among the general medical profession, that the treatment of a cross-eyed child should not be started until the child is old enough to go to school. There also seems to be a very prevalent idea that an operation is the best treatment for squint. Little do they realize that, by the time the child has reached the age of five or six years, great and permanent damage has been done the crossed eye. It is true, as stated by H. L. Arnold[9], that in the older child an operation may straighten the eye, but it is then too late to restore the lost vision and fusion sense. When we consider that binocular vision is a result of the development of the fusion sense, and that the fusion sense is developed in the first year of life and is gradually strengthened up to the seventh or eighth year, so much so that the sight of one eye may be lost, yet no deviation of that eye will occur. As Claud Worth says: "When the fusion faculty is fairly well developed, nothing but an actual muscular paralysis can cause an eye to deviate, in which case the resulting diplopia is intolerable. Sometimes, however, owing to a congenital defect, the fusion faculty develops later than it should, or it develops very imperfectly, or it may never develop at all. Then, in this case, there is nothing but the motor coordinations to preserve the normal relative directions of the eyes, and anything which disturbs the balance of these coordinations will cause a permanent squint. Thus, the essential cause of squint is a defect of the fusion faculty."

This disturbance of the fusion faculty may result

(9) New Orleans M. & S. J., June, 1929.

from a number of causes, infectious diseases, fright or shocks to the nervous system, hereditary, anatomic anomalies, and the one most commonly found, errors of refraction. In order to prevent the confusion of seeing double, nature gradually but surely suppresses the vision of the weaker eye, so that by the time a child reaches the age of 5 or 6 years, the sight of that eye is permanently impaired.

Therefore, in the treatment of this condition, it is most important to get the child early. This can be done only by educating the family doctor and the public not to wait until the child is ready for school. We must get them to bring the child for examination as soon as the condition is discovered. We should take time and patience to examine these cases thoroughly, and the parents should be impressed that they, too, must take time and patience to carry out all directions given them. Too often the parents lose hope if they do not see immediate results. Parents often have a strange prejudice against such a young child wearing glasses. Frequently some kind friend will tell them that the child's eyes are being ruined by wearing glasses which may be strong enough for the grandmother to read through. Unless you get the confidence and cooperation of the parents, you are doomed to failure before you start.

Of course, any necessary attention to the general condition of the child should be attended to, for a weak or sickly child does not respond well to treatment.

The eyes should be examined and most carefully refracted under atropin. In the very young, this sometimes necessitates several attempts before a satisfactory examination is made. Of course, in eyes where there is an opacity in the media or other defects, it may not be possible to give much relief, but fortunately, most of these cases are due to errors of refraction. Rather full correction should be ordered, but overcorrection causes a blurred image and tends to weaken the development of the fusion sense. The age at which glasses can

be started is usually stated in the textbooks as three, but in many cases they can and should be ordered at the age of two years or younger. The atropin should be continued for several days after the glasses are placed on the child, and then stopped. The child should be kept under observation. If the eyes become straight and remain so, good and well, if not, then the fixing eye should be kept under the influence of atropin for a period of time, or, perhaps, better still, the fixing eye should be kept bandaged for several hours each day, so as to force the use of the squinting eye. This treatment should be kept up for at least one or two years. If this fails, the use of bifocal glasses may be tried.

When treatment is started in a child of 2 or 3 years of age, in most cases the vision of the squinting eye will become normal and the eyes will be straight, but if treatment is delayed until the child is 6 years or older, the vision will never become normal.

Operative treatment has not been mentioned because these cases should be treated before an operation is advised, and if treatment is started early enough, in most cases, operative treatment will not be necessary.

H. W. Wurdmann[1] says that the visual act is of threefold nature: muscular, consisting of accommodation and ocular rotations, which are coordinated movements in bi-seeing eyes; physiologic, mechanical in the formation of the retinal images, physiochemic in excitation of the retinal elements, and physioelectric in the nerve excitations; then mental, with the brain views blended into one image and received, perceived and evaluated by the sensorium in their relations to the outer world.

Any obstruction to vision, inequality of accommodation or action of the recti, interferes with the coordination of action of the two eyeballs and affects the mental perception so that fusion or binocular images is not produced. There being no general to coordinate the brigades, anarchy occurs and the stronger prevails, the other

(1) Northwest Med., April, 1929.

eye turning in, out, up or down, producing strabismus which is generally inwards. The deviating eye suspends vision from time to time, suspensopsia, and after a while is forgotten by the brain, losing more and more vision; the condition of amblyopia ex anopsia.

Mental vision is not developed under three months of age; that is, the child does not recognize objects or individuals, events, mother, until that old. Both eyes are not used together until about this age, when coordination of accommodation and convergence occurs with correlation of the mental images to the outside world. All this means that babies under three months do not have straight eyes and they do not perceive objects until this age, and that, if the faculty of seeing with both eyes at once is not then developed, they squint and ultimately lose the sight of the crooked eye.

Cross-eyed and wall-eyed people are materially handicapped. Besides being only one-eyed, the cosmetic defect has a deleterious effect upon their social and mental development and in later life interferes with their love affairs and their business. For what man likes to look into the eyes of a cock-eyed maid or who wants to do business with a man who does not look one square in the eyes? Therefore, squint should be prevented, and if the eyes do not function together they should be straightened, and it can be done in almost all cases.

Every oculist is contantly told by parents or patients that their family physician had advised waiting for glasses and operation until the child has reached school age, or even till he was fourteen or fifteen years of age; that he might "grow out of it."

This writer goes on to state that the two important functions in vision are (1) accurate vision with each eye and (2) the ability to use both eyes together. The former is acquired early, the latter late and under adverse conditions, the latest function being usually the earliest lost.

The most frequent cause of deviation is a large error of refraction, in which any cause reducing the bodily

resistance, as measles, whooping cough or other illness, affects the subconscious mind of the child, when it finds difficulty in seeing, and can not make the extra effort for coordination with concomitant movements and parallelism of the globes in all directions. So efforts at fusion, which is a congenital faculty, are abandoned; the better eye wins out and the other usually turns in. Hence the development of squint is usually ascribed by the parents to whooping cough, measles, etc.

If both eyes have almost the same acuity and refraction, the eyes may alternate in use. Approximately the prism degrees of convergence are thrice the diopters of accommodation. Therefore, if a child starts out with 5 D. of hyperopia, it has to accommodate this much for distance and with this would go thrice the amount of convergence, and then would, if it were not corrected by dissociation, squint 15 degrees. Then, as we have two eyes, and at first the image of each is perceived by the brain, double vision occurs, which nature does not like, and hence pulls the weaker eye further out of the way, making a secondary deviation of greater degree. The primary deviation is always in both eyes, and both eyes squint. Hence, when operation is needed, it is usually necessary to operate on both eyes. Of course, there are other causes of squint but this statement takes care of the usual cases.

But operation is unnecessary in the early stages, in fact seldom under the fifth year of life. Out of the last fifty cases of squinting children under twelve years of age the writer has operated on but three, and all of them now have straight eyes.

Occlusion of the better eye for two hours morning and afternoon aids the amblyopic eye's vision, but constant occlusion may cause amblyopia and deviation and would be more likely to cause a persistence of the squint. These methods involving occlusion of the better eye are of little avail. An exercise for amblyopia may likewise be given by the test letters, the patient gradually increasing his

distance away from the letters as he perceives them better.

Cases that come to operation in the third to eighth year of life sometimes achieve normal stereoscopic vision, but after this age all we can expect is a fairly good cosmetic result with the expectation that later in life a relapse or an overeffect may be the result of all our work. An overcorrection by operation should never be made. Always leave a little of the original deviation; rather advance or make stronger the so-called weaker muscle and avoid the calumny later in life of being accused of having made your patient "wall-eyed."

The treatment of squint should be given as early as it is observed. Most cases are cured by lenses and orthoptic exercises. All cock-eyes can be cosmetically cured. Get them early and get results.

Start the treatment of strabismus as soon as deviation is noted after three months of age, and you can safely promise straight eyes with binocular vision without recourse to operation in practically all cases, but wait a few years and you can promise nothing but an approximate cosmetic correction with one poor seeing eye.

The first step in treatment is to treat the parents. Tell them what can be done and what can not. Insist that orthoptic treatment and lenses first be tried before any recourse is had to operation and even in these it is to be continued until stereoscopic vision is established. Explain that the usual case should have the refraction measured, lenses prescribed and that glasses should be worn all the time and ocular exercises, etc. should be continued for at least six months; that all eyes can be straightened and that they must be not only for cosmetic reasons but in order to preserve the sight. Do not allow yourself to operate until sufficient orthoptic treatment has been given.

Before two years of age, atropinization and lenses should be employed. The procedure in the average case is as follows. After two years of age exercises with the

Worth amblyoscope, a stereoscope with movable sides in the doctor's office. The colored Knoll's charts for very young children and the Well's charts with the stereoscope for older ones at home will, with corrected refraction, in nine cases out of ten straighten the eyes within a few weeks.

These methods relieve excessive accommodation, get clear images in both eyes by glasses and excite the fusion center to work by the development, first, of double images and then fusion into the single image of normal vision. By these we develop the sensation of depth and full binocular vision. This can be done up to the sixth year, after that but seldom, and practically never after adolescence.

[Ophthalmologists recognize the importance of this early treatment of strabismus. Many parents naturally go to their family physicians, in these cases, before consulting an oculist. Physicians who advise the parents to wait until the child is older, "as he will probably outgrow it," should learn that they are guilty of criminal ignorance.—Ed.]

Paresis of the Motor Oculi Nerve. In the latter part of their course the third, fourth, fifth, and sixth cerebral nerves are all intimately connected as they traverse the sphenoidal fissure and the cavernous sinus. At their deep cerebral origin they are also closely related, more especially the nuclei of origin of the third and fourth nerves. The former lies close above the latter in the floor of the aqueduct of Sylvius connecting the third and fourth ventricles of the brain. It is reasonable, therefore, to expect that any peripheral or central lesion of the third nerve will also be accompanied by symptoms arising from complication of any or all of the fourth, fifth, and sixth cerebral nerves. In practice this is the usual experience.

Gordon Robinson[3] describes the following case in which symptoms of paresis of the motor oculi nerve

(3) Brit. M. J., Jan. 19, 1929.

alone, unaccompanied by symptoms of other nerve complication, is perhaps deserving of record owing to its comparative rarity.

A man, aged 42, complained of diplopia, the onset of which first became apparent about six weeks previous to his seeking advice. There was a history of syphilis contracted about six years before this date. The knee-jerks were absent.

On examination of the left eye it was apparent that there was slight but definite ptosis of the upper eyelid, together with slight external strabismus. Upward movement of the eyeball was defective, as also was inward movement of the organ. Movement of the eyeball downwards and outwards was unimpaired. On comparing the pupils of both eyes there was obvious mydriasis on the left side. The conjunctiva was perfectly clear, with no sign of venous congestion. Ophthalmoscopy revealed no optic neuritis, retinal changes, or hyperemia. The right eye was normal. The Wassermann reaction was positive. The fourth nerve was obviously unaffected, since the superior oblique muscle, which causes the eyeball to turn downwards and outwards, appeared to be functioning well. Implication of the fifth nerve was eliminated by the fact that there was no neuralgia either of the supra-orbital or any other type. There was no internal strabismus which would be caused by paresis of the sixth nerve affecting the function of the external rectus muscle. The lesion could not have been peripheral, not only because the third nerve alone was implicated, but because there was no venous congestion of the eye or orbit pointing to pressure on the cavernous sinus.

Here, then, was a condition of central origin, affecting only the motor oculi nerve. In view of his history it was thought the condition was most probably due to a gumma, situated close to the nucleus of origin of the third nerve in such a position, and of such a small size as not to encroach upon the closely placed nucleus of origin of

the pathetic nerve, and to give rise to no retinal changes indicative of intracranial tension.

He was put on a course of injections of gray oil, at weekly intervals for eight weeks, and increasing doses of potassium iodid, orally, three times a day after meals for four months. At the end of that period the troublesome diplopia had completely disappeared, together with the ptosis, and the external strabismus was hardly noticeable with the eye at rest. The pupil reacted quite briskly, and had become the same size as its fellow. The Wassermann reaction, however, still remained positive.

The Conjunctiva

Bacteriological Examination of Conjunctivitis Cases. In a period extending over a number of years, S. Hanford McKee[4] has made hundreds of bacteriological examinations. A negative result from a smear examination is always followed by an epithelial cell smear stained by Giemsa's or Wright's solution. This method gives a very satisfactory differentiation between micro-organisms and cell cytoplasm.

He finds that acute conjunctivitis is generally due to the pneumococcus, the influenza bacillus taking second rank. By far the most prevalent form is due to the Morax-Axenfeld diplobacillus, usually manifested in a chronic catarrhal conjunctivitis, but not infrequently in an acute type which may be complicated by corneal ulcer or by absorption iritis. In the Morax-Axenfeld cases the diplobacillus is found constantly in the nose.

The treatment par excellence in Morax-Axenfeld conjunctivitis is frequent instillation of a weak solution of sulphate of zinc, an eighth to a quarter of a grain to the ounce. The drops should be used generously and for two or three weeks, as otherwise the condition is only im-

(4) Am. J. Ophth., June, 1929.

proved and not cured. Ulceration of the cornea due to this infection reacts well, too, to sulphate of zinc.

Phlyctenular Kerato-Conjunctivitis. Phlyctenular disease is an important lesion of childhood because it is one of the most common. It is second to ophthalmia neonatorum as a cause of blindness in children. Phlyctenules differ from other inflammatory processes of the conjunctiva in that they are limited to a localized area and are not diffuse. In the simpler cases we may use whichever local remedies the patient may need and in a short time the ulceration will disappear and the eye appear normal again. But the discouraging fact is that in a few weeks or months the condition will return. Frequently phlyctenules may be seen in the conjunctiva, at the limbus and in the cornea, in the same eye at the same time. As Duane says, in this way a disease which is a perfect unit, clinically speaking, is torn in two for the love of system. In discussing the etiology of this condition, R. M. Armstrong[5] states that while there is no definite proof of the specific nature of phlyctenulosis, he believes that clinical evidence and experimentations strongly support the theory of its tubercular origin.

Pathological investigations have not yet thrown much light on the question of the etiology of the disease. Smears and scrapings of the phlyctenules have not shown any organism which might be held accountable for the condition. Though there are one or two unaccepted reports of tubercle bacillus being found in the lesion, animal inoculations from these lesions have been negative. Sections of eyes in which the lesions have occurred have not shown any definite proof of a causative agent, though the phlyctenules do somewhat resemble a tubercle in structure.

Nor does animal experimental work give any definite light on the subject conclusive enough for absolute proof. Finnoff, in his series of injections of rabbits, first with

(5) Kentucky M. J., September, 1929.

live tubercle bacilli and later with dead tubercle bacilli, was able to produce in the majority of his animals typical tubercular lesions of the choroid and of other structures of the eye. However, in only one instance was there developed a phlyctenule. This is not enough to warrant any conclusions.

So that we are left largely to fall back on our clinical investigations and conclusions as to the nature of this disease.

For a long time there has been noticed a relationship between this disease and tuberculosis. The scrofulous diathesis, as it is called, occurs often with our phlyctenulosis. This would explain it so simply if we could let it go at that. Back in the times before Koch discovered the tubercle bacillus, in 1882, various diseases were called scrofulous. The suppurative glands of the neck which broke down and drained were called scrofulous. Then there was scrofula of the face and scrofula of the joints. In those days phlyctenulosis of the eyes was called scrofula of the eyes because it was noticed that so often it was associated with the other lesions of scrofula. This made matters very simple. Life for the doctor in those days was simpler when it came to diagnosis. There were such good old diseases as typho-malaria and brain fever, which explained many a condition to the satisfaction of all. After the discovery of the causative agent of tuberculosis, phlyctenulosis was regarded as a disease unto itself, but the fact remains that we still have the same clinical relationship between phlyctenulosis and other so-called scrofulous conditions.

In the first place, phlyctenulosis is observed as, are the other scrofulides, in the young—from one to fifteen. It is associated with poor development, with filth and with poor hygienic surroundings. It usually has as a background a faulty diet and a lack of fresh air. It is a disease of the sun-starved of the cities.

With this in mind there has long been a suspicion and

a belief on the part of many that the causative factor is tuberculosis. Work with tuberculin seems to substantiate this theory. The tuberculin test is still a subject for argument as to its accuracy, and while it is not infallible proof of anything it is generally considered good corroborative evidence when taken along with other diagnostic findings. In several series of injections made on children routinely and on children having a phlyctenular eye condition, the positive reactions in those with phlyctenulosis are uniformly higher than in those who have not. This is not proof positive of the etiology but would seem to be worthy of careful consideration.

Now as we have these cases so uniformly from poor surroundings, there is also reason to the argument that it is the poor hygienic surroundings themselves which are responsible for the disease, as are these surroundings responsible for the tuberculosis. Some argue that phlyctenulosis and tuberculosis go together so often because the same surroundings will produce either. Whichever the case may be, there is undoubtedly a close relationship between phlyctenulosis, poor hygienic surroundings and tuberculosis.

Some claim that the disease is caused by excessive eating of carbohydrates, especially candy and sweets. Signorina Elching and Colombo claim that it is caused by the absorption of indol from excessive sugars. There seems to be no direct proof of this, but these patients do respond and begin to improve when they are placed on a diet of plain food and the use of sugar is stopped.

A. B. Marfan reports some interesting experiences in the Presse Medicale of September, 1928. At the time that the Von Pirquet test was first being extensively used, it was noticed that there was quite a reaction of the conjunctiva in some cases when tuberculin was dropped in the eye. So from this observation it was suggested that the reaction be tried by dropping the tuberculin in the eye instead of using it hypodermatically.

So Marfan decided to try a series of these cases, but he says that he very promptly stopped as four of his children showed a tubercular reaction which persisted for several months. These lesions were very typical of phlyctenulosis and for this reason he regards phlyctenulosis as definitely tubercular. M. Weeters has produced phlyctenulosis in rabbits by injection and he considers this proof of the nature of the etiologic factor. All of these facts seem to point to tuberculosis as the etiologic factor, though we are not justified as accepting this as a fact. Tooke, of Montreal, takes the view that it is wholly due to poor hygiene, and in addition to the other hygienic factors mentions decayed teeth, infected tonsils, intestinal absorption of poisons. He says ignorance and the slum are the prime etiologic factors, other factors, of which tuberculosis is only one of many, follow in their wake.

The local treatment we need only mention. The use of calomel powder or yellow oxid of mercury in the milder stages, when there is no involvement of the cornea, is the old standby. When there is a very inflamed eye and corneal ulcers we use, of course, atropin and something soothing. The general treatment is the important matter.

Correction of the diet, cleanliness, fresh air and sunshine are the prime essentials. These measures are agreed as advisable by all, no matter what are their views as to the etiology. And so often, unfortunately, these are just the treatments that the patients are unable to take on account of their financial condition. Duke-Elder has reported good results from using the quartz lamp on these patients, and this seems a logical treatment to supplement the fresh air therapy on cloudy days. Tuberculin is a valuable aid in these conditions and a tuberculin reaction is advisable in these cases. Of course, these patients should have a thorough chest examination before this is done that there may be no danger of relighting some other focus of the disease.

Trachoma

The Etiology of Trachoma. Among the last studies completed by the late Hideyo Noguchi, whose untimely death was a severe loss to experimental medicine, there was a series of investigations of trachoma the result of which is published as a complete and well illustrated report[6].

While numerous bacteriologic studies have been made in this disease none, prior to this present investigation had found any micro-organism satisfactorily or entirely fulfilling the postulates essential to its recognition as an etiologic agent.

Noguchi's experiments, which are reported in great detail, have resulted in the discovery of a new bacterium (Bacterium granulosis N. Sp.), which he believed to be the etiologic agent in trachoma. To support this belief strong confirmatory evidence is produced.

Bacterium granulosis is described as a small, motile gram-negative organism, somewhat resembling those of the xerosis group, from which it is distinguished, however, by its biologic and chemical characteristics.

When inoculated into chimpanzees, Macacus monkeys, and the baboon it produces lesions which grossly and histologically are characteristic of trachoma in the human being. The organism can be found in the lesions so produced, is found in sections from human trachomatous lesions, and is now in its fifth series in animals (culture to rhesus, rhesus to rhesus, rhesus to chimpanzee, chimpanzee to chimpanzee, and chimpanzee to rhesus).

The experimental chronic granular conjunctivitis produced by Bacterium granulosis preserved its clinical and histologic characters throughout several passages and the lesions have been shown to be infective as early as seventeen and as late as two hundred and four days after the original culture inoculation.

(6) J. Lab. & Clin. Med., April, 1929.

No other organism obtained from human cases of trachoma produces in animals comparable effects.

It appears, therefore, that the etiologic agent of trachoma has at last been isolated.

The Lacrimal Apparatus

Lacrimal Duct Stenosis. Lacrimal duct stenosis may be either congenital or acquired. These are again divided into simple stenosis and stenosis with an infection of the lacrimal sac. These infections may be acute or chronic. There are also stenosis from malignancy, traumatism, and so forth, but these latter types are not here considered.

Congenital stenosis is accounted for by a failure of the central cells to degenerate and be removed from the cylinder in late prenatal life, and the child is born with an imperforate duct. The treatment for this condition is to force an opening by passing a probe. Instead of passing the probe through a slit canaliculus, F. W. Dean[7] has devised a method for the relief of this condition, by which he believes he gets as good, if not better, results as by the method of Dupuy-Dutemps-Bourguet, as described in last year's edition of this book.

He opens directly into the sac just below the ligament of the obicularis and passes the probe through this opening. This method has the advantage of leaving the canaliculus intact, of allowing the use of a larger probe, and of less danger of making a false passage. It also facilitates the proper cleansing of the sac and applying whatever antiseptic is desired to the mucous lining. It is very seldom that the probing needs to be repeated. If the operator has the sense of touch with a probe that he should have, he is not going to cause trouble, and if

(7) Paper read before Omaha-Council Bluffs Oph. & Oto-Laryng. Soc., March 20, 1929.

the probing is done through an opening directly into the sac he should encounter no difficulties.

The treatment of acquired stenosis with or without a dacryocystitis by the Bowman method—that of passing small probes by way of the canaliculi—has been largely and should be wholly abandoned, as it yields only 5 to 10 per cent cures. The treatment with the larger probes of Theobald and Ziegler gives better results but not enough better to warrant a continuance and especially when a dacryocystitis is present.

Treatment by extirpation or obliteration does away with the infected sac and the danger to the eye from that infection, but the annoying epiphora remains to a greater or lesser degree.

In the last eight or ten years much work has been done, mostly by rhinologists, to perfect an operation, the object of which is to provide drainage from the sac directly into the nose. This objective is attained by an external approach as by the Toti-Mosher operation or by an intranasal approach as by the Halle-West operation. The result desired by each of these methods is to secure a large opening from the sac directly into the nasal cavity at the anterior end of the middle turbinate body. Cures of from 60 to 90 per cent are reported by the operators using these methods.

In spite of the large percentage of cures reported there are objections to these operations. First, it seems hardly a safe procedure to conduct pus from the lacrimal sac directly into the nares in the region of the ethmoid cells, especially if some of the anterior cells have been broken down as is usually done. There is also danger of infection of the maxillary antrum if pus is deposited in proximity to its ostium. Second, there is too much danger that infectious material might be forced from the nares into the eye with so short and direct a connecting passage. Another objection which is not vital is that of giving over a part of ophthalmic surgery to the rhinologist.

Proceeding to the steps of his operation, Dean says that if by pressure on the sac its content is forced through the canaliculi we know they are patulous. If this cannot be done a No. 4 Bowman probe is passed into the sac to make certain the canaliculi are not closed. Next, the tissues having been anesthetized, an incision is made into the sac. The cut extends from the ligamentum obicularis down to the lower border of the lacrimal groove. The opening is about 7 mm. long. There is no necessity of cutting the ligament of the obicularis and it should not be done. Through the opening in the sac the content is washed out and a 2 per cent solution of silver nitrate is used on a swab to thoroughly wipe the entire mucous lining. The sac is then packed with a wick dampened with a 10 per cent. solution of cocain with a drop of adnephrin added. In five or ten minutes the anesthesia is complete and the probes are passed through the duct. A 2.5 mm. probe is followed by 3.0, 3.5, and 4.0 mm. probes. One cannot use all sizes in each case. A 4 mm. probe can be passed in some cases and a 3.5 mm. in most. After the duct has been dilated a 2.5 mm. silver drainage tube is introduced and the dressing applied. At intervals of two or three days the sac is treated through the incision and the tube and dressing replaced. When the sac is cured of infection and the duct is well dilated the incision in the skin is allowed to close which it does in two or three days without leaving a visible scar. Four to six visits are required as a rule to complete a cure.

Following this technic nineteen cases have been treated. Of these nineteen, seventeen were successes and two were uncompleted.

The percentage of cures in this small number of cases is as good as is that from any other method. The infection of the sac was cured and the drainage reestablished through the normal passages, which is a distinct advantage over the Toti-Mosher or the Halle-West method. If the stenosis is caused by an infection from the

nose as a majority seem to believe, and at the time stenosis is relieved the nose is in good condition why should a reinfection be expected? If the stenosis is caused by an infection in the sac and that infection is cured and drainage reestablished, there should be no return of the trouble.

To effect a cure one must get rid of the infection in the sac. This can be done by the open method. To rid the sac of infection is tedious and next to impossible unless it is treated as an open cavity.

It is easier to cut directly into the sac than properly to slit the canaliculus. The large drainage tube can be used through the skin incision, but not satisfactorily through the canaliculus. The canaliculi should not be slit except in those rare cases when it is necessary to curet for trachoma and then they should be allowed to close at once.

Free drainage is reestablished by the use of large probes followed by the inserting of the large silver tube which is left in the duct between dressings. Through a 7.0 mm. opening into the sac one is able to study the lacrimal duct as readily as in the cadaver. In all but two of these cases the stenosis was at the upper end of the duct. In the two exceptions the stenosis was about 1 cm. from the upper end.

The calibre of the ducts lined with mucous membrane is measured in millimeters by the size of the probe which can be introduced. When as large a probe as will enter the duct is passed, the handle can be moved forward and back and from side to side. The part of the probe which is in contact with the upper end of the duct does not move, showing that the duct is of larger calibre at the lower end than at the outlet of the sac.

An ophthalmologist, along with other accomplishments, should be of a mechanical turn of mind. Such an one must see the advantage in this method. There is a closed cavity filled with pus. The rational way to treat such a cavity is to convert it into an open cavity.

To dilate and treat a lacrimal duct can surely be more easily and accurately done when there is no tissue to go through before reaching the duct.

Foreign Body in the Lacrimal Sac. A woman, 37 years of age, had a dacryocystitis in 1904, at which time the lacrimal sac had been incised. Seven years later she had a "white growth in her throat." This was

Fig. 12—Appearance of right eye, showing argyrosis of lower half of the eyeball.

removed, and the attending physician, having decided that the growth was caused by her old eye condition, tried to put a metal drain in the lacrimal sac, but was unsuccessful. Then he placed a solid silver stilet, apparently first making an opening into the nasal cavity through the lower punctum and the region of the lacrimal sac. The stilet had been in the nose ever since.

In the last few years the patient had noticed that the coloration of the lower part of the right eye has been changing to black and that the lower eyelid had been turning out. The patient said that she wanted to pull

out the stilet but had never received the necessary advice to do so from a physician.

When examined by F. H. Rodin[8] in 1928 the right eye revealed that the lower canaliculus had been split. On pulling the lower eyelid at the inner canthus a small silver metal was seen lying in the split canaliculus. The bulbar conjunctiva of the lower half of the eyeball was dirty gray (argyrosis). There was a moderate ectropion of the inner half of the lower eyelid (Fig. 12). The backgrounds were normal on examination.

The stilet was removed by grasping the presenting part with small forceps. It came out without difficulty.

The stilet (Fig. 13) was 1.25 mm. in diameter and

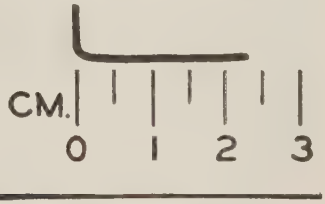


Fig. 13—The silver stilet found in the lacrimal sac.

weighed 0.195 mg. (3.5 grains). The horizontal limb was still silver colored and was 7 mm. long, while the vertical part was tarnished and blackish and was 24 mm. long.

Congenital Dislocation of Lacrimal Gland. Van Heuven[9] reports a case of coloboma and pedunculated fibroma of the upper eyelid in a 6 months old child, associated with a white tumor, having an elevation of about 2 mm. overlying the upper and part of the lower temporal quadrant of the cornea and covered by the conjunctiva. After removal of the fibroma, this tumor also, which was provisionally diagnosed as a dermoid or lipodermoid, was excised. It was firmly attached to the

(8) Div. Ophth., Stanford University School of Medicine. J. A. M. A., Nov. 17, 1928.

(9) Nederl. Tijdschr. v. Geneesk., July 8, 1928.

cornea throughout. It was found to consist of normal lacrimal gland tissue. Later the author saw a similar case of dislocation of the lacrimal gland in a girl, aged 11. In this case, as in the first, the condition had been present since birth and had previously been diagnosed as lipodermoid. Here also he operated. The tumor was loosely attached to the cornea, more firmly to the sclera. A normal lacrimal gland was found embedded in fatty tissue.

The Cornea

Principles of Treatment in Corneal Ulceration. E. Temple Smith[1] calls attention to the fact that in this condition both atropin and eserin seem to be used, often alternately, without reasons being given, except that the eye was not improving under the one or the other. As the action of these drugs is so diametrically opposite, it would be of value to the practitioner to be told the indications for each.

What are the principles involved in the use of atropin or eserin in corneal ulcer? Most septic ulcers are pneumococcal. Any septic ulcer may be pneumococcal. With a corneal ulcer due to this organism iritis is always associated. Hence atropin is essential; it is vital. What will it profit a man if he recovers with a clear (or nearly clear) cornea, if his iris is glued down to his lens and the pupillary area is occluded by a plastic exudate? Therefore, in any septic ulcer the general practitioner will be well advised not to coquette with eserin, but to use atropin early and to use it often.

A condition then arises—speaking of the typical sloughing, hypopion ulcer—characterized by great pain and progression of the ulcer whose margin shows gray and ominous infiltration. The pain is due to a secondary glaucoma, set up by the albuminous content of the aqueous, induced by the hypopyon and the iritis; these in

(1) M. J. Australia, Jan. 12, 1929.

their turn caused by the toxin from the corneal infection.

What, then, are the indications for treatment? Obviously, to lessen the formation of toxin in the ulcer by local measures of destruction or antisepsis and, secondly, to promote natural healing by leukocytosis in the cornea by lowering the tension. The essential factor in the vicious behavior of these ulcers up to this point in the treatment lies in the stagnation of the lymph flow through the cornea caused by pressure from within. Leukocytosis is arrested and bacterial invasion of the cornea proceeds uninterruptedly. To use eserin, however, is to accentuate the cause of the raised tension, the iritis a vicious circle. The treatment of the raised tension is not medical, but surgical.

As regards the ulcer, it should first be thoroughly curetted with a fine knife, to remove all necrosed tissue. Then zinc ionization should be applied, not when the cautery has failed, but as a substitute for it. The cautery necessarily destroys sound tissue during its otherwise beneficent work of destroying bacteria and the resulting slough leaves one in doubt from day to day whether one is viewing the cautery slough or an extending ulcer and time for important action is lost. If zinc ionization is not available, carbolic acid should be used freely after scraping. Both these remedies can be used daily if necessary. Atropin is used freely.

It must have been observed that these septic ulcers often show no sign of abatement until the cornea has perforated. They then get rapidly well. Is not this a clear indication—a tip, so to speak—for treatment? A time-honored remedy is, when all else has failed and most of the cornea is involved, to make a corneal section through the floor of the ulcer.

When first seen, if there is infiltration round the ulcer (indicating sepsis), paracentesis at the limbus should be done and repeated every day and not reserved until the eye is doing badly. This tapping of the chamber gets

rid of albuminous aqueous and allows of its replacement by a normal aqueous and by lowering tension allows lymph flow, with opportunity for leukocytosis, to take place. If the pain recurs or if there is a sloughing ulcer when first seen, with hypopyon, a de Wecker's anterior corneal section is done. This may sound drastic, but experience shows it to be both safe and effective.

At the time of the first ionization, with or without general anesthesia according to the amount of congestion and the temperament of the patient, an incision is made by transfixing the cornea at the horizontal meridian in the limbus as for a cataract flap and the section is completed, all but a small bridge at the vertex. This allows free drainage of the anterior chamber for a much longer period than does a paracentesis. The chamber can be drained daily, if need be, by inserting a repositor or von Graefe knife in the incision at one side. There is no danger of infection, as the flow is always from within outwards and there is no suction.

If there has been complete sterilization of the ulcer by ionization or other means which if necessary may be repeated, there is no physiological bar to the process of repair, such as exists when the tension is raised. A full dose of morphin is given before the corneal incision is made and there should be no further pain unless the rise of tension recurs. In this case it must be again lowered by tapping the chamber. As an alternative and especially if the condition be an advanced one when first seen, the floor of the ulcer may be perforated with a fine knife; this incision is very readily opened daily for tapping purposes. As this requires less skill than any other form of paracentesis, it may be commended to the general practitioner should he be unfortunate enough to be landed with such a case without access to a specialist and is anxious to do his very best for his patient. The point to be emphasized is that in a septic hypopyon ulcer lowering the tension by tapping the chamber should be done early and not be employed only as a last resort.

What are the indications for eserin (or pilocarpin) in corneal ulcers? In the type which is not pneumococcal, in which there is no liability to iritis, the use of eserin is in some cases quite rational. This writer uses it as a routine in ophthalmia neonatorum to lessen the chance of ulceration or to promote its healing. It increases the blood supply of the ciliary body and increases the lymph flow in the cornea. In this disease, if severe, the limbal vessels and the lymph-channels are liable to compression by the chemosed conjunctiva encircling the cornea. Any drug which increases the lymph supply of the cornea, seems rational in use. In practice Smith found this borne out. In neurotrophic ulceration, too, where nutrition is supposed to be at a low ebb, eserin is helpful. The general practitioner, however, unless he is able to discriminate between these types will be less likely to do harm by using atropin in all corneal ulcers.

A further plea for the use of ionization—Smith says that carbolic acid will kill any microbes that are accessible and this without destroying healthy tissue. It penetrates deeply. He does not know of any other means of reaching a deeply-seated infection.

This is in no sense to be taken as a complete account of the treatment of corneal ulcer. It is an attempt to rationalize the treatment of the pneumococcal, the most dangerous type, on a physiological and pathological basis.

Spreading Ulcer of the Cornea. In the whole domain of ophthalmology there are only a few diseases that rapidly destroy sight, and one of these is the spreading ulcer of the cornea. In all other diseases that may cause blindness we have time to try various remedies for a number of days or even weeks, but with spreading ulcer, quick judgment and effective measures are prerequisite to success in preventing blindness.

These ulcers, leaving out those caused by diseases like smallpox, scarlet fever and measles, are sometimes caused by such an insignificant traumatism as brushing of a

leaf or scratching of a finger nail, or by a severe traumatism like a piece of stone striking the eye. The pneumococcus is the infecting organism in a great majority of instances.

The progress of the infection and its most successful method of treatment is described by D. M. Yazujian[2].

After a trauma there is sometimes very little discomfort felt; only slight lacrimation and photophobia. This feature of the disease makes it more treacherous, as it causes loss of valuable time. However, sooner or later severe pain sets in and compels the patient to seek relief. The stage in which we find the ulcer depends in a great measure on how early the pain started. One may find a pinpoint ulcer or an extensive lesion with edges undetermined, center bulging or already ruptured. In whatever stage it is found there usually is cloudiness in the surrounding cornea. In very virulent cases a pinpoint ulcer may in 24 hours practically cover the whole cornea. This speedy development of the disease makes it imperative that every lesion suspiciously like ulcer shall be seen frequently and at close intervals, and at each visit the site of the ulcer, together with its diameter, should be plotted on the patient's chart in order to make comparisons at the next visit.

Treatment: Several years ago when ethylhydrocuprein hydrochlorid, commonly known by the name of optochin, was discovered we thought that we had in it a specific for all pneumococcic infections. Unfortunately, experience with it has cooled off our enthusiasm for it. While it may, like other antiseptics, such as mercurochrome, metaphen, zinc sulphate, eventually control the infection (not to mention the sloughing it occasionally causes) it cannot be depended upon for promptness of action. And this is not surprising, because, while the antiseptic may be efficient enough to kill the bacteria in vitro, it cannot reach those imbedded in the substance of the cornea; therefore, it is inefficient until the slough is thrown off

(2) J. M. Soc. New Jersey, November, 1928.

and the bacteria are exposed to its action. However, by the time this takes place the ulcer may have spread all over the cornea. In the experience of this observer, Prince's pasteurizing treatment has the same drawback, namely, it is too slow to check spreading of the ulcer.

Reports about Shahan's thermophore treatment, though meager, have been encouraging. In 1917, Shahan reported a series of 32 cases successfully treated, and in 1926 Phinney reported 3 cases, 2 of which were successful but the third case must be considered a failure as it took 3 applications and more than 2 weeks time to check the ulcer.

After some modifications the procedure adopted by the writer is as follows: On seeing a suspicious case of corneal ulcer the site and diameter of the ulcer is plotted

Fig. 14—Yazujian's cautery needle. Note the point is a single wire extending 4 mm. beyond the twisted double end.

on the patient's chart. Depending on the site of the ulcer, the patient is seen at intervals of 8-12 hours; the closer the ulcer to the center of the cornea the shorter the interval. If the surrounding cornea is cloudy the ulcer is cauterized with pure carbolic acid, regardless of absence of hypopyon. A spreading ulcer is always anticipated if the history shows that a piece of stone has been the cause of the injury. One per cent mercurochrome is prescribed every 2 hours and atropin. At the end of 8-12 hours the patient is seen again and if the ulcer is found to be threatening the center of the cornea, the ulcer bed is cauterized without further delay using the flat side of an electric knife cautery and the cornea is punctured with the cautery needle devised by Yazujian (Fig. 14). The puncture is always made within the ulcer bed and in the pupillary area if feasible, in order to avoid anterior synechia. The cautery needle should be heated to bright cherry-red, and as soon as the anterior

chamber is entered, which fact is announced by a spirt of aqueous humor, the thumb is taken off the cautery button and the needle withdrawn. The aqueous humor cools off the point of the needle, and with ordinary care and promptness no injury is done to the underlying structures. During the operation the eye should be kept open by a speculum, the eyeball steadied with fixation forceps, and the arm of the operator held firmly against his side with hand resting on the patient's face in order to insure steadiness and perfect control. At completion of the operation atropin is instilled, a bland ointment applied, and the eye bandaged with gauze and adhesive. The patient is kept in bed for a couple of days. On the day following operation, when the bandage is removed, the spread of the ulcer will be found checked, and on the second day regression will be noted. Thereafter, appropriate treatment for a regressive ulcer is instituted.

A number of illustrative cases are given.

Tattooing of the Cornea with Gold and Platinum Chlorid. Tattooing of the cornea was brought into prominence in modern times by de Wecher, in 1870, by using india ink introduced into the cornea by mechanical means. Since then many other substances, including lamp black, candle black and many colored pigments, have been tried. Holth, in an article published in 1926, gives an excellent report of the necessary technic and also gives glowing accounts of the results of his work with this method, but for the average man such achievements are out of the question. Most results have been disappointing. A fine black pupil, achieved with much effort and some pain becomes, in the course of a few days, woefully light again.

In 1925 Knapp of Basel presented a method of chemically introducing a color into the cornea. This was the precipitation of the gold from a gold chlorid solution into the corneal stroma. Good results have been reported from this method.

While the exact technic of using the gold chlorid has

varied with different workers, a brief outline of the most generally practiced method is as follows:

1. The cornea is anesthetized with cocain or phenacain, without epinephrin.

2. The area to be stained is outlined carefully with a large trephine or fine knife. The epithelium is thoroughly and evenly scraped off.

3. Hemorrhage is stopped without the use of epinephrin.

4. A cotton carrier, large enough to cover the part to be stained, is dipped in the faintly acid gold chlorid 2 per cent solution, pressed out so as not to be dripping wet, and held against the denuded area. A fresh applicator is used every minute. After three minutes there will be a brown and after five minutes an almost black stain.

5. The reducing agent, epinephrin, or the more vigorous fresh 2 per cent tannic acid, is then dropped on the surface of the cornea for from one to two minutes; the eye is flushed with physiologic solution of sodium chlorid, and is then bandaged.

Epinephrin must not be used during the anesthetizing, as it will reduce the gold chlorid as soon as it is applied, and before it can penetrate into the corneal stroma.

The epithelium must be thoroughly and evenly scraped off. Some workers even recommend that some of the superficial stroma be removed to produce a stronger, darker stain. To achieve a gray instead of black the cornea may be stippled, the result being a large number of fine black spots which give a gray appearance against a light background.

The best results have been reported from the use of a 2 per cent gold chlorid solution neutralized with sodium bicarbonate, so that it is just faintly acid to litmus paper. A too strongly acid solution causes undue irritation and vascularization, which is undesirable. The gold chlorid does not need to be sterilized, as it is an

antiseptic in itself. Very dense and vascular leukomas may need a 3 per cent or possibly a 4 per cent solution. Any scar of the cornea, even thin staphylomas with iris inclusion, which under the old method of pigment and needle had to be let alone, can be readily and safely tattooed. By staining the maculae dazzling can be reduced, with great improvement of vision. There is little irritation afterwards, and usually only a little pain for from twelve to twenty-four hours. The epithelium regenerates in four or five days.

In the reports of several hundred successful cases, only three complications of a serious nature have been noted.

The results are fairly gratifying. Fine maculae and normal corneas over complicated cataracts in blind eyes stain easily, and apparently the stain is quite lasting. It may fade a little in the course of six or eight months. Vascular leukomas are more difficult to stain and fade more rapidly, due to the fact that the good circulation helps carry off the deposited gold.

The colors obtained vary. An absolute black seems not to be possible. Dark brown and gray black, both of which appear fairly black at a short distance, are the best results, though not invariably obtained. Strict attention to the technic so as not to stir up irritation (avoiding too acid solutions, too deep scarification, or the use of epinephrin before application of the gold chlorid) will result in deeper and more permanent colors. Conversely, if a light gray or brown is desired, some of these factors can be varied.

In endeavoring to improve the gold chlorid technic, Krautbauer worked with other substances. He tried silver nitrate, as had Gifford and Steinberg. In 1928 he reported brilliant results with platinum chlorid, hydrazin hydrate being used as the reducing agent. Knapp as well as Gifford had tried platinum without success, as they had not used this strong reducing agent. In Krautbauer's cases an absolute dense black with a metal-

lic luster was obtained, quite superior to the color resulting from the use of gold.

The technic is similar to that for gold but is somewhat simpler. No neutralization of the platinum solution is needed. On the other hand, the hydrazin hydrate must be fresh, never more than a week or ten days old. The concentrated solution of this substance keeps well, and from it the 2 per cent solution can be made up shortly before it is used.

Dohrmann K. Pischel[3], who has been doing experimental work on rabbits, outlines the technic as follows:

1. The field is prepared (anesthetizing and scraping off the epithelium) as for gold.
2. It is washed with sterile distilled water instead of salt solution.
3. Two per cent platinum chlorid is then applied on an applicator for two minutes, as for the gold.
4. It is reduced with hydrazin hydrate for twenty-five seconds, then washed promptly with sterile water. The color should appear promptly by this time.
5. Two minutes later the eye is washed well with physiologic solution of sodium chlorid.
6. The eye is then bandaged.

The hydrazin hydrate is best applied from a dropper, a small drop being allowed to run onto the treated area and to rest there until washed off. This prevents any unnecessary irritation of the remainder of the cornea.

In his experimental work on rabbits, Pischel tried many different methods and different solutions, such as gold chlorid, silver nitrate and finally platinum chlorid. He believed that staining with fluorescein after scraping off the epithelium would enable him to determine whether the scraping had been done evenly. Accordingly he added this step to the technic after step 2, and found it a great help. The cornea was then washed thoroughly with sterile distilled water before the next step was carried out. (Fig. 15)

(3) Tr. A. M. A., Eye Section, July, 1929.

Summing up the results of his experimental work, he found that the platinum chlorid gave the blackest color and lasted the longest. Used after fluorescein it gave an evener color than without it, as may be seen if *B* and *C* are compared with *E* in the accompanying illustration. In the rabbits with normal corneas tattooed nine months ago, the stain has not faded at all. The gold chlorid reduced with hydrazin (*F*) faded only slightly, and could be used for dark brown. The gold chlorid reduced with tannic acid faded considerably, that done without fluorescein more so than that done with it (*D* and *A*).

The author had the opportunity of using this method

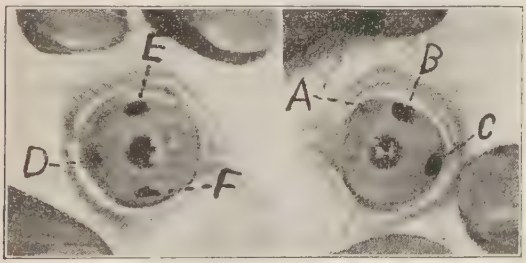


Fig. 15—Eyes of albino rat showing results of tattooing: A, gold chlorid, reduced with tannic acid (faint); B and C, fluorescein, platinum chlorid, reduced with hydrazin hydrate (good, black); D, fluorescein, gold chlorid reduced with tannic acid (brown); E, platinum chlorid, reduced with hydrazin hydrate (good, but irregular border); F, gold chlorid, reduced with hydrazin hydrate (dark brown, but irregular border).

only twice on patients. The first had a large dense leukoma adherens, occupying the lower half of the cornea. The pupil was very small and displaced upward. The iris was dark brown. There was a pterygium-like area of conjunctiva drawn over onto the cornea from 4 o'clock for about 4 mm. This was removed by a McReynolds operation. Nine months later the white leukoma was tattooed with gold chlorid, fluorescein being used to mark out the denuded area and tannic acid 2 per cent to reduce it. Three operations about ten days apart were necessary to get the whole evenly stained a good brown.

The reactions after each one were moderate, consisting of slight pain for about twelve hours, with some ciliary injection for forty-eight hours. The final step was the making of a black pupil. This was made a little too small for cosmetic purposes, but in the intervening six months it has not faded at all. The result has been very satisfactory to the patient.

The second patient also had a dense leukoma adherens, reaching up to the pupillary border (the result of smallpox). The iris was brown. As in the first case, this scar was tattooed in three stages with gold chlorid and a good brown obtained. The postoperative reactions were the same. A black pupil was not put in because the patient's wife thought that his appearance had been improved so much that it was not necessary to do any more.

The author concludes that tattooing the cornea with gold or platinum chlorid is an effective means of coloring the cornea brown or black; this method is much simpler and safer than the older methods, and the results as far as permanence is concerned seem satisfactory, though a sufficiently long time for final judgment has not passed.

Delayed Corneal Ulceration from Mustard Gas. Two cases of this unusual condition are reported by R. Foster Moore and F. Heckford[4], and are worthy of record, not only because of their intrinsic clinical interest, but because of their specific importance from the viewpoint of war pensions. These ulcers have features which are so characteristic as to render them almost pathognomonic, and there should be no fear, therefore, of false claims being made for pensions on account of ordinary corneal ulcers.

The history of the two cases is as follows.

Case 1.—A medical man was attacked by mustard gas in 1917, and is in receipt of a pension for defective sight of the left eye from corneal nebulae resulting from ulceration in 1922. The right cornea was unaffected until

May 7th, 1928—that is, eleven years after the gassing. It then spontaneously became ulcerated at a point downwards and to the nasal side. The ulcer at first was small, but afterwards enlarged so as to involve more than one-third of the area of the cornea. From the first it was deep and crater-like at its center, extending down to Descemet's membrane. For many weeks it seemed that it would perforate at this spot; but this did not happen, and it ultimately healed over. In the sub-

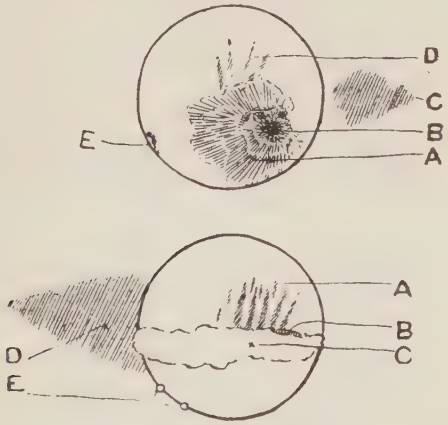


Fig. 16.

stance of the cornea were gray lines of infiltration radiating more or less from the borders of the ulcer; a small area only was stained by fluorescein.

On curetting, the surface epithelium of the cornea was found to be sodden and ill nourished for a considerable area around; it easily separated, leaving a large bare surface. The substantia propria was infiltrated in such a way as to produce a sort of cleft in its substance in a plane parallel with the surface. The ocular conjunctiva exhibited the appearance, to be referred to later, which is characteristic of these cases. (Fig. 16 C, upper; D, lower)

(4) Brit. M. J., March 16, 1929.

Some iritis developed, but it was very mild in degree, and caused no trouble; the left eye remained quiescent throughout. There was never any very acute reaction in the eye, and photophobia was less marked than would have occurred from an ordinary ulcer. The general appearance was that of a slowly spreading, very indolent ulcer, of which a small part only stained; corneal infiltration extended in advance of the ulceration, which gradually spread so as to invade the pupillary area, producing considerable defect of vision, which necessarily is permanent.

At the end of five months it seemed that the extension of the ulcer had stopped. The clear point where Descemet's membrane had been exposed was becoming healed and the excavation gradually filling in. This progress has continued up to date; repair, however, is even now, at the end of seven months, by no means complete.

Case II.—A healthy man, aged 38, when first seen gave the following history. He had suffered badly from mustard gas burns in the usual parts of the body, including the eyes, in July, 1917; he was invalided as a consequence. From that time to the present he has been bothered at intervals by bright lights, but otherwise has had no particular trouble until July, 1928, when both corneas developed small deep ulcers, which showed little staining with fluorescein. Since then his trouble has slowly progressed, until on November 22nd, 1928, the condition of the eyes was as follows.

Extending across the cornea of the right eye from side to side, and beyond it on each side, invading the sclera for a short distance, was a deep, gutter-like excavation of the corneal tissue (Fig. 16 C, lower). The edges had a somewhat rolled appearance, and at the situation B, Fig. 16, lower, were sodden-looking and stained on instilling fluorescein; the remaining area did not stain. Above the ulcer, in the situation A, Fig. 16, lower, was a grayish, somewhat linear infiltration of the cornea,

and at E were two small punched-out circular ulcers. The conjunctiva over the area D, Fig. 16, lower, was opaque white, and marbled in appearance, as described later.

The condition of the left eye was in all essentials similar to the right, but ulceration was not so extensive. There was the same gutter-like excavation affecting the part of the cornea exposed in the palpebral fissure. It extended rather more than half-way across the cornea, and involved the adjoining corneo-scleral junction; a small spot only stained. The conjunctiva showed the same scarred appearance, and there was no intra-ocular involvement.

It may at once be stated that all the eyes had essentially similar features, though differing in detail. The special features of these ulcers on examination are: First the intolerance of light is much less marked than might have been expected from the extent of the ulcer, and the circumcorneal injection of the eyes was less than would be present in other forms of corneal ulcer of similar dimensions in patients of this age. The ulcers themselves showed a marked tendency to involve the parts exposed in the palpebral aperture—that is, of course, the part originally exposed to the gas. They were deeply excavated, had a gouged-out appearance, and the tissue at the edge appeared sodden and ill nourished. They extended deeply into the substantia propria—so deeply, in fact, as to expose Descemet's membrane in Case I. They did not, however, perforate. In general appearance they reminded one a little of a Mooren's ulcer. The instillation of fluorescein did not produce extensive staining, but only showed up small spots or areas, chiefly at the edges.

From the shelving side of the ulcers infiltration could be seen extending into the adjoining cornea, and showed up as a gray area in it which had a linear arrangement (Fig. 16 D, upper; A, lower). In one case iritis was present, but it was quite mild, and this in spite of the

long persistence of the condition. In both cases, one or two small localized, deep, nearly circular ulcers developed at the limbus (Fig. 16 E, upper and lower).

A marked feature of the ulcers was the long period, roughly ten years, between what clearly was their ultimate cause and their actual development; their extreme indolence; their situation in the palpebral aperture; their deep, gouged-out appearance; the comparatively mild symptoms; and their slow healing. The conjunctiva within the palpebral aperture has a very characteristic appearance, and even now is a good deal reminiscent of its appearance at the time of the gassing. It is somewhat swollen and in parts is almost of a homogeneous pearly white color; in other parts, where it is less opaque, it has a marbled appearance, the "veining" effect being produced by the vessels, which in places show great irregularity in their calibre. It seems reasonable to suggest that it was the damage done to the vascular and nerve supply of the cornea by the gas, and the subsequent scarring, which has resulted in permanent impairment of the nutrition of the cornea and so to its ultimate ulceration.

With regard to treatment, the most help is to be obtained from curetting any staining area, and cauterizing this small point very carefully with carbolic, or with the actual cautery. Many other drugs were tried without any clear advantage.

Herpes Zoster Ophthalmicus

Herpes Zoster Ophthalmicus. This disease is not encountered frequently, except in a large consulting practice. There are certain phases, however, with which every practicing ophthalmologist and general practitioner should be familiar, and are here outlined by Luther C. Peter[5].

In the evolution of knowledge concerning ophthalmic

(5) Pennsylvania M. J., June, 1929.

herpes zoster, there are two outstanding facts: (1) Herpes zoster, as it is known today, is of much more serious import, from a prognostic standpoint, than was believed in the past. (2) Although knowledge of the subject has been considerably amplified during the past decade, many points will require clarification before definite conclusions can be drawn as to the etiologic relation between simple herpes, herpes zoster, chickenpox, and vaccinia; as to the possible relation, if any, which posterior-ganglia lesions in herpes zoster may bear to lesions in the anterior horns in acute poliomyelitis; and as to the relation, if any, which encephalitis of herpes zoster may bear to encephalitis lethargica and other forms of encephalitis. Much research work will be required before the clinical concepts of these several conditions can take definite form.

In the subject under discussion, we are especially concerned with a clear differentiation of primary or so-called essential herpes zoster, clinically known as epidemic herpes, and secondary herpes zoster, called by Paton and others "symptomatic." Simple herpes may also bear some relation etiologically to herpes zoster, but clinically the former is so mild in character that it is easily distinguished from the latter.

In *secondary herpes zoster,* severe neuralgic pain may precede the eruption for periods of days and even weeks. The eruption clears rapidly without deep scarring and pigmentation of the skin. A most characteristic and differentiating sign is the tendency to recurrence. Recurrence in primary herpes is exceedingly rare, one attack usually conferring immunity. Head and Campbell found but four recurrences in a series of 400 cases. In this secondary variety, the gasserian ganglion and the posterior root ganglia become involved during the course of an inflammatory process, such as syphilitic or tuberculous meningitis, following trauma of the spine or skull, or subsequent to tumor formation of the brain or other parts of the head. One case cited by E. B. Spaeth, had

three recurrences, due to an osteoma of the lower maxilla which was accidentally uncovered by roentgen-ray photographs of the maxillary sinuses. The herpes disappeared with the removal of the osteoma and did not subsequently recur. The reasons for involvement of the gasserian ganglion and the posterior sensory ganglia in the conditions cited have not been determined. The form of herpes zoster occasioned by them is different from the primary variety and should be clearly differentiated. The term "secondary" is more correctly applicable than is that of "symptomatic," which is frequently used.

Primary or essential ophthalmic herpes, as a rule, is ushered in with three or four days of pain and hyperesthesia of the skin supplied by the branches of the fifth nerve—a neuralgic pain of severe type. Constitutional disturbance of moderate degree may occur simultaneously. There may be a moderate rise in temperature and general malaise. Occasionally, the eruption may appear at the same time, but more often after the third or fourth day. In "secondary" herpes, the pain may precede the eruption for days or weeks. The vesicles at first contain clear fluid, which is "sterile in all ordinary culture media" (Paton). The clear fluid soon becomes clouded, the pustules break down, and scab formation follows. After the healing process is complete, permanent pits remain, with scar-tissue formation and discoloration of the skin. The surface temperature on the affected area is higher than on the normal side. Horner and Paton found as much as two degrees' difference in the surface temperature. Anesthesia of the skin is marked. Patients complain of "tightness" of the skin, and in damp weather or when physically below par, of painful points—"anesthesia dolorosa." In practically all of the cases personally observed, these painful periods continued well into convalescence. An outstanding fact is the epidemic character of this form of herpes zoster. This, together with its appearance occasionally during epidemics of chickenpox, was observed by many of the

early writers on the subject. Isolated cases are recorded, but many have been observed in which the epidemic character was clearly established.

The symptoms of primary ophthalmic herpes zoster, as briefly outlined, in many instances include the sum total of symptoms observed. Of more serious import, however, are the symptoms and complications of extension of the process to other branches of the fifth nerve. Although the conjunctiva is found to be involved to some extent in practically all cases of ophthalmic herpes, definite involvement of the globe occurs in approximately 50 per cent of the cases (Paton). If the eruption appears on the upper lid, a pseudo- or a true paralytic ptosis is a frequent complication. Extension to the globe is apt to involve the integrity of the transparent media of the eye and to bring about complications—iritis or iridocyclitis with increase in the intra-ocular tension, oculomotor palsies, optic neuritis, optic atrophy, and even an encephalitis which has much in common with encephalitis lethargica.

Ptosis. Drooping of the upper lid, a common complication, may be purely inflammatory or it may be paralytic in type, in which case the sympathetic nerve or a branch of the third nerve may be involved. True ptosis is exceptional; inflammatory ptosis is usual.

Pseudoptosis, due to inflammatory edema of the lids, is apt to be present in all cases of the ophthalmic variety. There are rare instances in which the muscle of Müller may be paretic because of sympathetic involvement. True ptosis, caused by paralysis of the branch of the third nerve which supplies the levator, is observed. It is alleged that the third nerve is more frequently affected than the fourth and sixth. If ptosis is excluded, it is probable that the fourth and sixth are as frequently involved as the third. The author has observed two cases of paralysis of the sixth, both of which recovered.

Corneal involvement is easily overlooked because of edema and consequent closure of the lids. It must not

be forgotten that most of these cases reach the ophthalmic surgeon only after serious complications arise, and as a rule, it is probable that the cornea is also involved. It is advisable, therefore, to inspect the cornea carefully in all cases.

Iridocyclitis. Second to corneal involvement, inflammation of the anterior uveal tract is most frequent and serious. In practically all cases in which the cornea is involved to any considerable extent, varying degrees of iritis will be found, in the milder degrees with subnormal intra-ocular tension, and in the severer cases with increased tension. It is the latter group of cases which causes the greater anxiety and offers the more serious prognosis. The bad prognosis which usually accompanies iritic involvement is due largely to the fact that the intra-ocular disease is not detected early enough to prevent posterior synechia by suitable symptomatic treatment. If it is recognized promptly and suitable treatment is instituted, iridocyclitis offers the usual prognosis.

Without entering into the details of treatment, this complication, especially when accompanied by increased intra-ocular tension, is so vital as to call for some reference to its management. Active uveitis associated with increased tension always presents a serious problem to the ophthalmic surgeon. In a majority of instances, repeated paracentesis of the anterior chamber controls the tension by changing the chemistry of the aqueous fluid, and allows one to continue the logical use of atropin which an inflamed iris demands. In exceptional instances, the tension continues to be high and the integrity of vision is threatened. These cases may call for an interchange of myotics and cycloplegics to meet the immediate indications. The average case, however, does well under atropin, and an undue rise of tension can be met by repeated paracentesis. Iridocyclitis is the important condition to combat, and the increased tension is a secondary process which, in all probability, is due to altered chemistry or to a blocking of the angle by

fibrin and cellular elements which are found in the aqueous. There are instances, however, in neglected cases, in which the high tension is caused by annular synechia. The prognosis in these instances is grave and the condition must be met as it is in other forms of iritis. Iris bombé should be treated by incision of the iris to admit of free communication between the posterior and anterior chambers. An iridectomy is contraindicated.

In neglected cases, posterior synechia is often well established. Degeneration of the iris with depigmentation usually follows, and eventually the end result is phthisis bulbi. If the synechia is not of long standing, even extensive adhesions may give way with the judicious application of adrenalin on cotton, which is placed under the upper lid after the instillation of several drops of a 4 per cent cocain solution. The adrenalin-soaked cotton may be left in place from 10 to 15 minutes, and the process may be repeated on succeeding days with excellent results. The same results may be obtained by subconjunctival injections of adrenalin, but the method is not free from danger unless the dosage is accurately measured and not over 0.4 of a c.c. of a 1:1000 solution is used. The former method is not accompanied by any risk of adrenalin shock.

Optic neuritis and optic atrophy are terminal results in a few instances. In experience they do not occur independent of serious uveal involvement. It is possible for the uveal tract to escape without much invasion, but it is probable that optic neuritis is really an extension of the herpetic toxemia from a badly diseased uveal tract. Optic atrophy is of the postneuritic type. It is one of the rare sequelae, secondary to optic neuritis and not a complication.

Ocular-muscle paralysis. Reference has been made to true ptosis. According to the literature it occurs occasionally. Two patients developed transient paralysis of the external rectus, and both made a good recovery. One developed during the course of a very mild attack

of ophthalmic herpes zoster, with the appearance of a few vesicles on the cornea and an attack of iridocyclitis. The other was a part of a violent herpes zoster ophthalmicus which resulted in blindness.

Encephalitis is a complication of rare but actual occurrence. The knowledge of encephalitis lethargica is broadening, but is still incomplete. It is no longer included in the rarer conditions encountered in medicine. Further research will be required before the various types of encephalitis can be properly classified. It is possible that the type which occasionally complicates herpes zoster may bear some definite relation to the lethargic variety. In calling attention to some of the rarer complications of herpes zoster, the fact must be emphasized that most of them are serious and that the commonly accepted term "shingles," especially as used by the layman, carries with it a feeling that it is not of serious import. Inasmuch as most of the ocular complications, if treated promptly, yield to rational treatment, and terminate fatally if neglected, the disease is worthy of serious consideration.

Herpes Zoster Ophthalmicus Treated with Convalescent Serum: Case Report. The following case is reported by Jonas S. Friedenwald[6] because it illustrates an unexpectedly favorable outcome in an unusually severe instance of ophthalmic herpes zoster, and because this outcome was associated with the application of a form of treatment which has not, he believes, been applied, heretofore, in this disease:

The patient was a woman of 47, a former nurse, whose personal and family history are not relevant to the present illness. She developed a lesion resembling simple herpes on the left cheek. One week later she began to suffer with neuralgic pains over the left side of her face, hyperesthesia of the forehead, and pain in the left eye. About two weeks later the left eye became inflamed. Seen the following day a moderate congestion of the

(6) Bull. Johns Hopkins Hosp., August, 1929.

left eye was found, and several minute superficial infiltrates were noted in the left cornea. The next day the pain was worse. There was a diffuse hyperemia throughout the region of the ophthalmic branch of the left trigeminal nerve, and many minute vesicles in the skin in this area.

During the next few days the condition progressed, typical zona lesions developed and extended from the tip of the nose to the vertex of the scalp. There were lesions on the nasal mucous membrane, on the palpebral conjunctiva, corneal infiltrates of increasing size and iritis of the left eye, great edema of the lids, excruciating pain, and fever up to 100 F. The general physical examination was negative. No other cutaneous lesions were found.

Five days after the onset of the cutaneous lesions and eleven days after the onset of the neuralgic pains, the patient was given an intramuscular injection of 8.5 c.c. of the blood serum of another patient who, six weeks before, had recovered from a severe case of perineal herpes zoster. Five hours after the injection the patient was more free from pain than she had been since the onset of the attack. By the next morning the edema of the lids had markedly decreased, and from this time on the skin rash rapidly subsided. The iritis, however, was very stubborn, and its treatment was complicated later by the fact that the patient developed a local allergy, first to atropin, and then to all other mydriatics. There were also severe neuralgic pains, together with numbness and hyperesthesia of the skin, which persisted for about two months, at which time the vision of the left eye was $\frac{6}{12}$ and in two more months it had improved to $\frac{6}{6}$.

Cases of ophthalmic herpes zoster with such extensive lesions almost always result in complete loss of vision from the corneal involvement. This has been known for a long time; indeed, Jonathan Hutchinson stated that when the tip of the nose was involved the eye would be

lost. Cases which, like the one reported, show corneal involvement early in their course, are particularly serious, and at the outset recovery of vision up to 6/6 was hardly to be anticipated.

Several other features of this case are of sufficient interest to warrant mention, — in particular, the iritis, which is not commonly found in these cases. The fact that herpes simplex occasionally precedes an attack of herpes zoster has been the subject of some discussion in the recent literature. It may also be worthwhile to mention that the patient gives a history of having had chicken pox in childhood, whereas most cases of herpes zoster appear to have escaped this childhood malady. No history of exposure to chicken pox or to herpes zoster within the incubation period of the illness could be obtained from the patient.

Cases of herpes zoster present themselves too rarely in ophthalmic practice to afford an adequate basis for testing the efficacy of any form of treatment. The writer feels justified, therefore, in bringing this interesting coincidence to the attention of those whose clinical material in this disease is more voluminous. No conclusions in regard to the usefulness of serum therapy can be drawn from the experience in this single case.

The Iris

The Pupils: Why Interesting? Ophthalmologists are familiar with the various pupillary anomalies, but the significance of some of the changes seen in an altered shape of the pupil, and abnormal reactions and their meaning, as here described by E. H. Cary[7], should be of interest to the general practitioner.

The size of the pupil, normally, is from 2.5 to 4.5 mm. Its size, however, is influenced by light, sensory stimuli, psychic stimuli, convergence and closure of the lids. These factors should be kept in mind when one examines

(7) Texas State J. Med., January, 1929.

a patient under varied conditions, wherein they might play a part. It must be remembered, too, that the pupils are smallest in infancy and old age, and are largest between the fifth and twenty-fifth years; age, then, is a factor in the size of the pupils. It is claimed that the smallness of the pupil, as one grows older, is due to the increasing rigidity of the walls of the vessels in the iris, along with a reduction of one's general excitability. This raises the question, why are the pupils of infants small? There is evidently no rigidity of vessel walls in infants. The remaining supposition is that there is a lack of excitability in the infant. We must remember, however, that at this age the primitive reflexes are in control, such as closure of lids and contraction of pupils, both of which are protective in character. Dilatation of the pupils is influenced later in the development of psychic influence.

As a general rule, the pupils are larger in myopic eyes of young persons because of a modified use of the accommodation. It is also true that one frequently sees a large pupil when there is a high degree of hyperopia. This may be explained through exhaustion of the accommodative effort; hence, large pupils in young persons are not an indication of myopia. It is also true that in high degrees of hyperopic astigmatism, these young patients frequently see best when reading matter is held very near, using the meridian of the eye less hyperopic. The presence of large pupils, and the fact that the patient sees best quite near, would suggest myopia to the superficial observer.

It must be kept in mind that pupillary reaction results from the stimulation, by light, of a small area near the macula, 3 mm. in radius, and that to this particular part of the retina is distributed the thicker fibers of the optic nerve. From the moment the light stimulus is received until contraction of the pupil occurs, there is a definite interval of time, which is said to be from three-fourths to one second. In this connection, it is well for

the general practitioner to keep in mind the value of observing the pupillary reflex of one eye, when what is known as consensual reaction, is developed through the stimulation of the other eye. Malingerers are often easily suspected and quickly disposed of when one utilizes this simple, but well known, reaction.

Cary next considers the tract over which the nerve impulse governing reflex contraction of the pupil travels. The rods and cones of the retina act as the pupillomotor receptive apparatus—the light stimulus passing from the retina to the optic nerve by which it is conducted. Within the chiasm a partial decussation of the fibers takes place and there the thicker of these pass along the dorso-lateral portion of the optic tract to the corpora quadrigemina. Here the stimulus is transmitted to the nucleus of the third nerve which returns the stimulus to the eye. The pupillary fibers starting at the third nucleus, occupy the inner portion of the nerve transmitting these stimuli through the tract of the third nerve, along the base of the skull into the orbit. In the orbit they form a part of the branches of the nerve to the ciliary ganglion. It is known that destruction of the ciliary ganglion results in absolute immobility of the pupil.

As to the reaction of convergence, contraction of the internal rectus does not cause contraction of the pupil. To look at an object always excites a central impulse which stimulates simultaneously the internal sphincter pupillae and ciliary muscles. The tract for this reaction is, therefore, from the cortex of the brain to the nucleus of the third nerve, through this nerve to the ciliary ganglion, and then through the short ciliary nerve. There are other reflexes of minor importance, such as the closure of the lids, and so forth.

The reactive dilatation of the pupils is important to keep in mind, for it is the other side of the question. A stimulation of the cervical sympathetic produces dilatation of the pupil. The nerve fibers that conduct the impulse leave the spinal cord at the level of the two

upper dorsal and the lower cervical vertebrae. They finally join the carotid plexus and then proceed to the cavernous plexus, uniting here with the ophthalmic branch of the fifth nerve with which they reach the eye by way of the long or short ciliary nerves. Most of the fibers are said to do so.

The sensory and psychic stimuli are, in part, said to be from the cerebrum to the nucleus of the third nerve, thence by way of the same nerve through the ciliary ganglion and the short ciliary nerve to the sphincter pupillae, the tonicity of which is caused to relax. It has been noted how the pupils dilate in anger and terror and, under such conditions, the stimuli of light are not great enough to produce contraction.

Psychic disturbances produce dilatation of the pupil, not only by inhibiting the third nerve, but by stimulating the dilating center of the medulla. This center, in turn, stimulates the sympathetic cord. From here, the impulse passes through the cervical sympathetic trunk to the superior cervical ganglion and thence over the carotid nerves and ciliary nerves to the dilator of the pupil. The reaction is very similar to such phenomena as the acceleration of the pulse and increase in blood pressure observed during anger.

Irritation of visceral sympathetic sensory nerves may cause dilatation of the pupil. These sensory impulses stimulate the sympathetic motor cells in the upper segments of the thoracic cord, and fibers from these cells conduct the impulses up the cervical sympathetic trunk, as previously described. If a destructive lesion involves the sympathetic fibers, the pupil will not be affected for the motor fibers are intact.

One must not lose sight of the fact that occasionally individuals with pupils unequal in size are seen, who are otherwise in perfect health. Slight degrees of anisocoria occur in healthy persons. When it is not associated with disturbances in the reactions of the pupils the condition is harmless. Such inequalities of the

pupils are thought to be congenital in some instances. When the condition occurs in the presence of diseases of the stomach, lung, kidney or liver, these may be the cause; but in such cases there is normal reaction to light, and the inequality in size is the result of stimuli from the affected viscus to the sympathetic motor cells in the upper segments of the thoracic portion of the spinal cord, transmitted from there to the superior cervical ganglion, and thence over the carotid nerves and ciliary nerves, causing dilatation of the pupil of the affected side.

Also sensory impulses from the gastro-intestinal tract may pass by the way of the vagus nerve to the dilating center in the medulla. From there the impulses pass down the spinal cord to the second thoracic segment to stimulate the dilating center in the spinal cord, as just described.

When these causes are excluded, namely, congenital and diseases of the internal organs, we must then think of such etiological factors as different refractive errors of the two eyes; unequal illumination; unlike adaptive conditions of the two retinas, or inequality of the reaction to the closure of the lids, the last named being of minor importance.

Conditions in which there is disturbance of the light reaction of the pupil that are met in practice, are (1) amaurotic immobility; (2) absolute immobility; and (3) reflex immobility.

In a given case of fracture at the base of the skull producing optic atrophy, the transmission of impulse of light stimuli is definitely interrupted, and there remains only consensual reaction from the opposing good eye and the reaction through convergence. In unilateral amaurotic immobility, the lack of response from direct stimulation results in a dilated pupil of the unilateral amaurotic eye. In bilateral amaurotic immobility, in which neither pupil reacts to light, the pupils are usually dilated. All are familiar with the absolute im-

mobility of the pupil for we are daily using atropin. The same condition is seen in botulism as a result of the toxemia in this condition.

Other factors to be considered are ophthalmoplegia interna the result of syphilis, or other toxic causes unnecessary to mention. Trauma may produce paresis, together with lacerations of the sphincter. A lesion anywhere in the tract from the sphincter to the nucleus of the third nerve may produce immobility; it can also be produced by stimulation from the cortex of the brain through innervation of the tonicity of the sphincter. Clinically, it is well to keep in mind that eserin will continue to act with greater efficiency if the lesion is situated posterior to the ciliary ganglion.

The general practitioner is interested in reflex immobility of the pupil, for this derangement is of great importance, because it is indicative of tabes and general and progressive paralysis.

Differentiation of reflex and absolute immobility must be determined. The absolute form occurs in progressive paralysis, less frequently in tabes. The differentiation is made by a test of reaction to convergence, which is prompt in the reflex immobility.

It is unwise to attempt to trace the origin of the lesion. It is not quite clear and there are several factors involved. One theory is that there is an absence of dilatation of the pupil to sensory and psychic stimuli, which produces this so-called spinal miosis. It has been stated that there are two centers of inhibition for the reflex of the pupil in the spinal end of the medulla oblongata, and it is correspondingly supposed that reflex immobility and miosis may be produced by disturbances of the tracts from these centers.

In 80 per cent of the cases of tabes, reflex immobility has special diagnostic value, due to the fact that it may precede the other symptoms of the disease by many years. It is also well to note that inequality of the pupils occurs in 40 per cent of the cases. In other words

there is reflex immobility, and unequal pupils as well. Syphilis is definitely associated with certain lesions of the nervous system. It seems to be the only cause of some. We must have, however, an open mind and look for other causes in many patients.

It can be stated that, in a general way, the pupillary symptoms alone are not sufficient to reveal any certain location of the lesion when the central nervous system is involved, and when the symptoms are other than of local character. No single phenomenon of the pupil is able to locate a lesion in a certain place in the central nervous system. This being true, the information gained from the pupils may be too variable, in some instances, to be of value in the diagnosis.

In acute alcoholism the pupils may be either contracted or dilated. The early dilatation of the pupil in intoxication is due to an excitation of the sympathetic; it soon contracts if the intoxication is not profound, but in the latter instance a fixed dilatation of the pupil occurs. There may be, from the brain cortex, an inhibition of the tonicity of the third nerve. One can also assume that the contraction of the pupil is due to a spasm of the sphincter pupillae and, so, most of the poisons produce reactions in different ways based upon the activity of the poison and the degree of reaction.

Gonorrheal Iritis. Every ophthalmologist has in mind the possibility of gonococcal infection when presented with a case of iritis of questionable etiology. Macy L. Lerner[8] points out the necessity of painstaking search and study of so-called "recurrent iritis" to prove that many of these cases are not obscure nor idiopathic in their etiology. Many of these patients would even retain some questionable teeth in their mouth and even innocent tonsils if we would only begin the search from below first and then go upward.

The infection of the genito-urinary tract in the male is unquestionably an important factor in ophthalmology,

(8) New York State J. Med., Oct. 15, 1928.

and every effort should be made to eradicate a possible infection before our attention is focussed to surgery in the mouth or throat. Indeed, often only a very competent urologist can assist us in these problems, because the general practitioner often fails to appreciate how a 16-20 year old gonorrhea, dating perhaps from adolescence, can produce a severe ocular inflammation.

Some authors maintain that 8 to 20 per cent. of all cases of iritis are due to gonorrhea. This is rather high, nevertheless, it should be borne in mind, considering the high incidence of gonorrheal infection in the male.

Gonorrheal iritis is never seen during the acute stage of the urethritis; it may make its appearance some months after the gonorrheal infection or may be delayed for years. The importance of eliciting a history of gonorrhea cannot be overemphasized. If ophthalmologists would question their patients more carefully as to a history of gonorrhea, the percentage of gonorrheal iritis would approach a higher mark than estimated.

The iris may be the only portion of the eye involved, but in the more intense cases the uveal tract and even the optic papilla may show signs of inflammation. The infection is endogenous, reaching the eye by the blood stream, but whether it is due to the gonococcus toxin or direct action of the gonococcus has not been determined. The gonococcus has only once been isolated from the aqueous humor of the eyes of a patient with gonorrheal septicemia.

It should be emphasized that gonorrheal iritis, no matter how stubborn it appeared to be to treatment before a definite etiology is established, is rapidly cured with the appropriate venereal treatment.

An English writer reports a case of gonorrheal iritis following a lapse of 16 years after the acute urethritis.

This brings up the question of how long the gonococcus can remain active in the posterior genito-urinary organs of the male. It is difficult to answer definitely,

but it has certainly been discovered after a lapse of 27 years.

There is one definite clinical characteristic in gonorrheal iritis, and that is that it has a tendency to recur. The term "recurrent iritis" is bad. It really means one thing, that the etiology has not been established, or the venereal condition did not get adequate treatment. Every male patient with recurrent iritis should have a thorough investigation of the genito-urinary organs by a competent genito-urinary man. The actual attack of iritis due to gonorrhea perhaps differs very little from that produced by other causes except that it may be associated with severer pain. It is of a plastic fibrinous nature, and the exudate may fill up the entire anterior chamber. Some authors believe the latter to be pathognomonic of gonorrheal infection.

In those eyes in which a recurrence has taken place it is typical of a gonorrheal infection that in the early recurrences very little ocular damage has been done, and only by careful examination can the results of a previous attack be demonstrated. In many cases nothing remains but very few, one or two posterior synechiæ, and then only seen after dilatation of the pupil.

In syphilis the iritis is either a secondary or tertiary manifestation. No recurrences are apt to be present until the tertiary manifestation. It is amenable to antiluetic treatment more easily. Definite yellow-red nodules may be present, resembling condylomata of the secondaries or gummatas of tertiaries.

It is mentioned in textbooks that gonorrheal iritis is always preceded or accompanied by articular pains. This does not seem to be correct because it is estimated that only 2 per cent of all cases of gonorrhea develop this complication.

In order to make a definite diagnosis a careful examination of the genito-urinary organs must be made, and it should be remembered that the absence of discharge from the urethra nor the absence of threads from the

urine can exclude the disease. The prostate should be thoroughly expressed and the fluid carefully examined microscopically a number of times. The microscopical examination of the secretion may show the gonococcus or an involution form; at times it will show only a few pus cells. The case then should be treated as gonorrhea, and painstakingly.

Chambers reported five cases of recurrent iritis in which the gonococcus was found in the expressed prostatic fluid. His cases were followed up for five years. Their gonorrheal history dated 4, 5, 9, 10 and 13 years back. Browning, bacteriologist to the London Ophthalmic Hospital, reports ten cases of gonorrheal iritis, all cured by proper venereal treatment, massage and vaccines. Schwenker, of the University Eye Clinic at Kiel, found 27 cases of iritis due to gonorrhea, out of 371 cases of iritis. Herrenschwand explains the predisposition to iritis in gonorrheal rheumatism by the presence of a latent tuberculosis. His treatment is therefore advocated against the latent tuberculosis, and less against the gonorrhea. He uses tuberculin. Sander Larsen reports a case of recurrent iritis of 14 years duration. His case was characterized by a stormy onset but benign course. The examination of the prostatic secretion for gonococci in repeated examinations proved to be negative, but finally gonococci were discovered and the iritis cleared up under treatment. The same author used successfully polyvalent gonococcic vaccines in another case.

The author describes two of his own cases developing 12 years after the attack of specific urethritis in one, and 8 years after in the other. He concludes:

1. A careful history, not only an ocular one as to previous inflammatory attacks, but also venereal, is of great importance.

2. Cooperation of patient, and an earnest attempt should be made to get his confidence in eliciting such confidential history. Very often a patient will not vol-

unteer such information to the ophthalmologist because of his lack of appreciation of the relationship of an ocular affection to a remote sin of his youthful days (especially true in married men).

3. Careful and repeated examination of the prostatic fluid should be made in patients with a gonorrheal history.

4. In doubtful cases, it should be treated as possible g. c. infection when other foci of infection are excluded and tuberculosis definitely excluded.

The Lens

Familial Cataract. There have been reported at intervals many interesting cases of cataract of various kinds occurring in members of the same family. Nettleship gave the pedigree of 100 individuals during five generations, 30 of whom had cataract. Wood, in this country, reported 6 cases of cataract in two generations of 33 persons. A. L. Brown recorded the case of a woman with what he called congenital nuclear cataract, whose 4 of 5 children, and 2 grandchildren, had the same condition. Recently F. N. Knapp reported hereditary cataract extending through five generations. Koby described a peculiar type of familial cataract, consisting of a number of opacities varying from thirty to one hundred, according to the subjects, and affecting all layers of the crystalline lens, though unequally. Curtin presented six cases of hereditary cataract in one family, the cataracts appearing about the eleventh year. Gonzalez, a Mexican opthalmologist, recently carefully studied congenital cataract seen in members of Mexican families. This by no means completes the list of reported cases.

In general, the mode of transmission is from an affected mother to her children of both sexes, and then from the females among them to their offspring, though there are some exceptions. Many congenital eye anom-

olies are transmitted in a similar way. There have been many theories advanced regarding the etiology of transmission, but none of them have proven entirely satisfactory, and many questions concerning family cataract are yet to be answered. The effect of consanguinity, and mental deficiencies, have been suggested as possible etiological factors, and other physical deformities have been noted in conjunction with hereditary cataract. It has at times been observed in connection with general disorders and disturbances of metabolism, such as syphilis, rickets, tetany, hyperglycemia and endocrine dysfunction.

Our knowledge in regard to the normal and pathological crystalline lens is rapidly increasing. This has in a large measure been due to the introduction of the slit lamp, for the anatomy of this most important part of the eye can be studied as never before, and it has opened up a fertile field for investigation in morphology, embryology and serology, and will be of immense aid in diagnosis and prognosis of one of the most frequent causes of blindness.

R. S. Leach[9] has recently seen members of two separate families showing this rather unusual form of hereditary cataract. The cases follow the general rule of transmission from an affected female. There were no consanguinous marriages. They all appear intelligent and have a fair education. Two of them completed the seventh and eighth grades and stopped only on account of their eyes. They are well developed physically and show no other physical abnormalities, or signs of degeneracy. The opacities would seem to increase with age, as they were less pronounced in the youngest, and the older the patient, the more marked was the condition. The individual eye histories would tend to bear out this conclusion. There was not nystagmus in any of them, and no fundus abnormalities were seen.

The condition as observed in both families appeared

(9) J. Tennessee M. A., February, 1929.

to be a somewhat unusual type of lamellar or zonular cataract with a tendency to degeneration of the clearer cortex. One can only speculate as to the etiology of these and similar cases, but the more research that is done along this line, the sooner will we be able to understand them and more intelligently treat them.

Hereditary Cataract and Curly Hair in Several Members of Same Family. In a family of father, mother and eight children, S. Werner[6] found cataract and curly hair in the father and three of the sons, the other children having straight hair and no signs of cataract. The cataract appeared in the father in one eye at the age of 22, in the other at 49, and in the sons at 23, 28 and 20 years, respectively. In one son the cataract was zonular; in the other cases the original type could no longer be seen. Dominant transmission of the cataract seems to Werner probable, the father being heterozygote with regard to the cataract factor. The inheritance of a disorder apparently hitherto latent in a family is assumed to be due to a so-called conditional factor. In this family a factor which causes curly hair appears to be coupled with the cataract factor.

Senile Cataract: Simplified Facoerisis. It is generally conceded that a senile cataract removed within its capsule requires more skill than the capsulotomy operation, but lessens the patient's stay in the hospital, eliminates secondary operations, and produces better results, providing the operation can be performed with no complications other than those of the capsulotomy operation.

Vitreous loss seems to be the principal objection to all methods of operating for cataract, and especially all intracapsular methods; but, if the intracapsular operation is understood, and its technic properly followed, there is but little vitreous loss and burst capsule would be the main reason of disapproval. Intracapsular operators report about 10 per cent of ruptured capsules which are classed by them as complications, but if this

(6) Finska läk.-sällsk. handl., December, 1928.

is a complication, then the capsulotomy operators must admit 100 per cent of complications from this source.

Some definite procedure that is not dangerous to the patient will naturally result from the various intracapsular methods having good points which can be performed successfully by average operators.

The method of procedure in this operation is so clearly described by W. A. Fisher[1], his article is given in full.

Preparation of the Patient: If the lids, sac, pupil, tension and smear are negative, a general examination is made which includes examination of urine, blood sugar and blood pressure. If the blood pressure is over 150, it is well to draw off ten ounces of blood from a vein one hour before operating. Three or four drops of a 2 per cent solution of homatropin or an ointment of 5 per cent euphthalminae, and 5 per cent cocain is instilled into the eye every forty-five minutes until full dilation is obtained, one or two applications usually being sufficient. Before cleaning the face for operation, a few drops of a 5 per cent solution of cocain is instilled into each eye, and, after four minutes, the face, brow and lashes are washed with soap and water; then with alcohol. The brow, lashes, lids, and the skin for two inches around the eye, are painted with 5 per cent solution of iodin.

The injection of 5 c.c. of 2 per cent of novocain solution is made ten or more minutes before operating (Fig. 17). Added to this ten drops are injected under the skin at the inner side of the nose. Pain is sometimes complained of from the injection, but this is lessened if a very small, sharp needle is used, first injecting superficially a small amount; then, after three or four minutes, the deep injection is finished with a large, long needle, injecting the solution as the needle is slowly withdrawn. The injection of novocain is imperative because it is difficult to know how a pa-

(1) Illinois M. J., September, 1929.

tient will perform when operated upon. A few drops of a 5 per cent solution of cocain is instilled into the eye every four minutes for four or five times, or until anesthesia is complete.

If the operator has reason to believe the patient will not fully cooperate it is well to do a canthoplasty and insert a suture to be tied when the cataract operation is finished. It is also advisable in such a case to inject five drops of a 4 per cent solution of cocain deep in the orbital cavity above, and ten drops of a 2 per cent novocain solution deep in the orbital cavity below,

Fig. 17—Method of procedure in three injections of 5 c.c. of 2 per cent novocain in order to effect complete relaxation of the orbicularis palpebrarum.

before beginning the operation. If these precautions are taken, general anesthesia will scarcely ever be necessary.

The Operation: A skin suture is placed in the upper and lower lid to be tied when the operation is finished.

A white silk suture is passed through the superior rectus muscle and given to the assistant to hold along with the upper lid hook. This suture is often used to pull the eye down when clearing the eye of debris and making the toilet.

The upper lid is held by a nurse or assistant, with an upper lid hook (Fig. 18). The lower lid is held by the thumb. The eye is flushed with six ounces of warm bichlorid of mercury solution, 1 to 5,000, and the excess removed with a sterile medicine dropper.

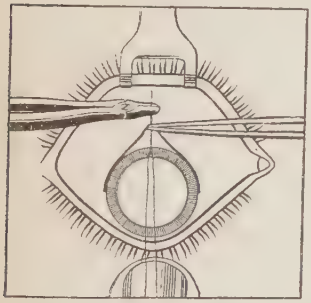
The Incision: The incision should be just a little less than one-half of the cornea, terminating in a conjunctival flap.

Conjunctival Suture: A suture is placed in the con-

Fig. 18—Fisher's upper lid hook.

junctival flap (Fig. 19). The thread is looped at the inner canthus to allow escape of the lens (Fig. 20).

The operator turns down the conjunctival flap with



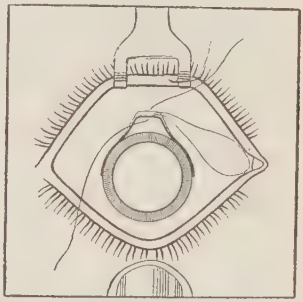
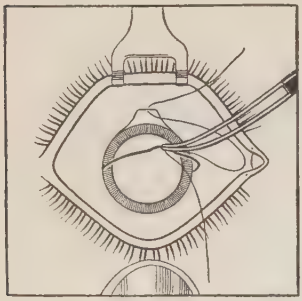


Fig. 19.—Left: Pupil is fully dilated, the incision is made and conjunctival suture placed.
Fig. 20—Right: The untied thread is looped at the inner canthus where it will not interfere with lens delivery.

delicate forceps (Fig. 21) and places the sterilized erisifaco directly and evenly upon the lens, and without the slightest pressure upon the lens, presses the button of the erisifaco. After counting seven, or about seven seconds, the erisifaco will be firmly adherent to the lens and the extraction is made by raising the lens up and out top side first, not tumbling (Fig. 22). Slight pressure upon the cornea below is made when the lens refuses to be born.

When the lens is out and adhering to the erisifaco, the corneal wound is gently rubbed with the lens to

straighten out the conjunctival flap and at the same time the top end of the suture is pulled upon to straighten the loop (Fig. 23). When the suture is tied,



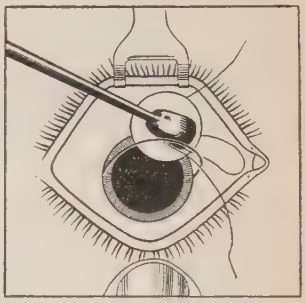
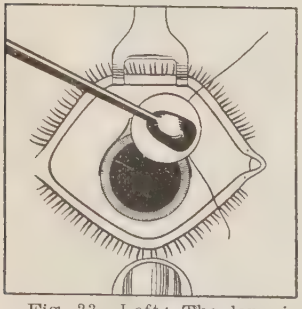


Fig. 21—Left: The conjunctival flap is held up with fine forceps. The erisifaco can be readily applied to the lens without looking through the cornea. The pupil is fully dilated.

Fig. 22—Right: The lens is delivered slowly passing over the edge of the fully dilated pupil. The thread loop is seen in the inner canthus.

the pupil will usually be found contracted and peripheral iridectomy can be made at the puncture or counter puncture (Fig. 24). Should the pupil not contract,



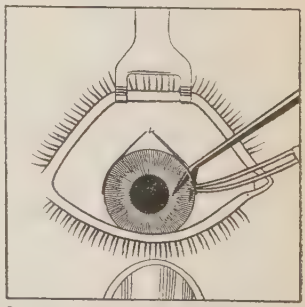


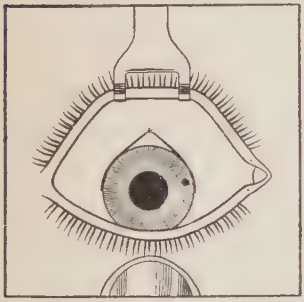
Fig. 23—Left: The lens is delivered, and while adhering to the suction cup, is placed over the conjunctival flap, rubbing it gently which straightens out the flap, and pulling the top end of the thread, straightens out the loop. The pupil is fully dilated.

Fig. 24—Right: The conjunctival suture is tied. The Hess iris forceps is passed into the anterior chamber at the outer or inner angle of the wound, the iris grasped and cut within the anterior chamber with Pasheff scissors. If the iris is pulled out of the wound a full iridectomy is liable to be made instead of peripheral. (Note the ease with which the peripheral iridectomy can be made on account of the contracted pupil after the conjunctival suture is tied).

peripheral iridectomy may be omitted. The finished operation is pictured in Figure 25.

Two or three drops of a 2 per cent solution of eserin is instilled. A 5 per cent solution of iodin is applied to the wound with a cotton carrier, the superior rectus suture is removed, and the lid suture is loosely tied. Yellow oxid of mercury ointment from a tube is applied to the lids and the eyes bandaged. The lid suture is removed after twenty-four hours.

Technique: To successfully remove cataracts by



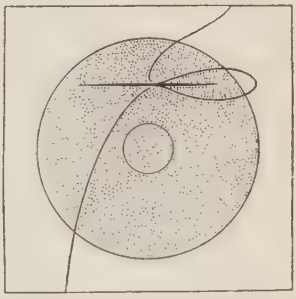


Fig. 25—Left: Finished operation. The pupil is contracted, the conjunctival suture is seen at top and the peripheral iridectomy at side. Barraquer makes peripheral iridectomy in the same way at top before lens is delivered. Elschnig makes it in the same place with scissors, not using forceps.

Fig. 26—Right: Represents a method of practicing facoerisis.

facoerisis, or by other methods, requires much experience. Six-weeks-old kitten's eyes offer good practice for making the incision and peripheral iridectomy.

Inserting and tying the conjunctival suture and for practicing facoerisis with chicken lenses see Figure 26.

The steps in simplified facoerisis technic will be easily followed by the accompanying illustrations:

The end of a large spool is covered with black cloth and a round hole is made in the center. A piece of transparent cloth is placed over the black with a slit to represent the incision. A thread is inserted to represent a conjunctival suture and looped for exit of lens. The hole in the spool is filled with cotton to within 1/16th inch of the top. On top of the cotton is placed the lens of a freshly killed chicken.

The edge of the incision is picked up with fine forceps, expos-

ing the lens and the erisifaco is placed evenly upon the lens. Without using any pressure the button of the erisifaco is pressed upon. This position is held while the operator counts seven, or about seven seconds.

The lens is lifted slowly, or drawn up and out. When the lens is out and adhering to the erisifaco, the lens is placed upon the incision, gently rubbing it which straightens the conjunctival flap and the upper end of the suture is pulled which straightens the loop. The suture is then tied, using forceps.

Complications: A poor incision, blood in the anterior chamber that cannot be removed, cutting the iris while making the incision, or a nervous patient, warrants an operator in changing from a new procedure to one he is in the habit of doing. If the erisifaco slips, the zonula will probably be broken and the lens can be removed by the Smith or Knapp method as a tumbler.

If vitreous loss occur before the lens is delivered, a full iridectomy is made and the lens is removed with a Smith spoon, the conjunctival suture is tied, and the toilet made.

If vitreous loss occur after the delivery of the lens, the conjunctival suture is tied and any tags of vitreous that are in the wound are cut off with scissors.

If the capsule is ruptured, the lens is removed and the conjunctival suture tied after which the eye is cleared of lens matter. Two per cent atropin is instilled after any complication.

After Care: The unoperated eye is made free the second day and the patient allowed to be up. There is no good reason for inspecting the eye for three or four days, but the danger of early and frequent dressing is lessened by the use of the conjunctival suture. Uncomplicated cases do not usually require treatment and at the end of a week, the bandage can usually be omitted and dark glasses substituted.

Pain: An enema, two live leeches to the temple, ten grains of aspirin together with blue mass 1 gr. T. I. D., as recommended by Smith, will probably be more effective than treatment with eye drops; however, atropin is often indicated but should be used cautiously.

Blood Injection: If vitreous loss or ruptured capsule occur, a blood injection is given the following day, as follows: Fifteen c.c. of the patient's blood is drawn from a vein, placed in a sterile test tube for 45 minutes; then stirred with a sterile glass rod; let stand five minutes; draw off 5 c.c. of serum and inject into a muscle. Every three days for three more injections, 15 c.c. of blood is removed from a vein in the same way and injected into a muscle at once before clotting. The object of this autohemotherapy, which is also effective in the treatment of sympathetic inflammation, is to prevent the development of postoperative inflammation.

FACOERISIS (Barraquer)

Pupil dilated but not too wide for peripheral iridectomy.
Peripheral iridectomy is made before lens delivery.
Erisifaco passed under cornea and placed upon the lens.
Lens tumbled and brought out bottom side first.
Peripheral iridectomy above before lens delivery.

FACOERISIS (Simplified)

Pupil too wide for peripheral iridectomy. (Fig. 19).
Peripheral iridectomy is made after lens delivery. (Fig. 24).
Corneal flap pulled down exposing lens for placing erisifaco. (Fig. 21).
Lens brought out top side first, over the fully dilated pupil. (Fig. 22).
Peripheral iridectomy at puncture or counter puncture after lens delivery and the conjunctival suture is tied. (Fig. 25).

Conclusions: The well-dilated pupil, complete anesthesia, the employment of lid hooks, raising the conjunctival flap and thereby exposing the lens, facilitates placing the erisifaco evenly upon the lens, without catching the iris, which is all-important. Lifting the lens slowly up and out will appeal to many. When the lens is out and the conjunctival suture is tied, the pupil usually contracts and peripheral iridectomy at puncture or counter puncture is readily made. The percentage of complications at time of operation will be reduced to a minimum, and when performed without complications there is no secondary operation and postoperative complications are rare, the best possible vision is obtained, and the time in the hospital is greatly reduced.

Last and best of all, the operation can be performed when the patient is unable to do that which he is called upon to do.

Mental Disturbances Following Operations for Cataract. It has been estimated that in from 2.5 to 3 per cent of all cases of cataract some mental disturbance develops following the operation. Numerous authors have published reports of cases of dementia, others cases of delirium, and others cases of acute mania. These definite varieties of mental imbalance, as their name indicates, are varying degrees of the same process. Some have asserted that such mental disturbances are not more common after cataract operations than after other surgical procedures; but Allen Greenwood[3] is firmly convinced, from his own experience, that operations on the eye involving a bandaging of both eyes are much more likely to be followed by varying degrees of mental imbalance than other surgical procedures performed under like conditions but without a blindfolding of the patient, especially in view of the fact that most cataract operations occur in those past middle life and often in the very old and feeble. All ophthalmic surgeons will concur in this belief and will agree that the blindfolding of both eyes and the age are the principal elements in the cause of these mental disturbances in patients who are anxiously awaiting the outcome of an operation on which their future vision may depend.

The various degrees of mental instability may occur any time from a few hours after the operation to several days following. They most commonly occur on the first or second night after the cataract operation. The patient often wakes from a sound sleep in the middle of the night, is unable to place himself, becomes panic stricken, loses his mental balance, and becomes delirious or actively maniacal. The dressings may be torn off and the patient may leave his bed and even run out of the hospital in his night clothes, as has happened once

(3) J. A. M. A., Dec. 1, 1928.

in the author's experience. Sometimes the patient becomes simply demented and does not recognize the nurse, physician, or even friends. Occasionally dementia becomes permanent and the patient has to be confined in an institution for the insane. This deplorable outcome, however, is extremely rare as the majority of patients with postoperative dementia, delirium or mania can be quickly cured, though occasionally not until serious injury has been done to the operated eye.

Most of these cases occur among patients operated on in hospitals.

Very little need be said as to the symptoms, for the terms alone imply the symptoms which arise in those with actual mental imbalances. One must also recognize the large number of patients with cataract who, while they have no actual mental instability, are yet more nervous, frightened, and less their normal mental selves than usual. These patients are perfectly conscious and realize their whereabouts, but the usual dread with which cataracts are always viewed has made them over-anxious, and often restless, with more or less insomnia. It is easy to understand why the dread of possible blindness may bring about these minor degrees of mental instability. Therefore it is important to consider a complication that may occur in from 2.5 to 3 per cent of all cataract operations and to give the treatment a careful study.

The most important phase in the treatment of the condition lies in its prevention. Too much stress cannot be laid on a study of the patient's mental condition prior to operation, and all efforts possible should be made to make this as good as possible up to the time of the operation and during its performance. The establishment of a mutual feeling of confidence between the physician and the patient is of major importance. A careful explanation to the patient of the nature of cataract and a creation on the part of the patient of a feeling of optimism should be worked for.

A series of carefully conducted examinations of the patient's other organs, which may have a bearing on the production of the cataract and the proper healing of the wound of operation, gives the patient confidence in the physician and aids in improving his mental condition. Teaching the patient how to behave at the time of operation is of great benefit. Assurance that ether anesthesia is not necessary and that with well administered local anesthesia pain is not to be feared will add to the patient's mental tranquillity.

After the patient has entered a hospital prior to a cataract operation, what can be done to lessen his nervous and mental excitability if such becomes apparent? The confidence inspired by the well chosen words of encouragement spoken by all who come in contact with the patient is most helpful, and there are several quieting drugs at one's command, of which the bromides, barbital or phenobarbital, are the most used. Some surgeons employ as a routine one of these drugs. Quieting drugs followed by a thorough and complete local anesthesia at the time of operation are the things most to be relied on. In some cases in which the patient is apparently on the verge of dementia prior to operation, a cataract operation conducted in the home of the patient is often the best insurance of a successful result.

Preventive treatment after operation is of great value. Let us consider for a moment the patient's mental state the first night after a cataract operation. Perhaps he has received some drug to help him sleep. He wakes up in the middle of the night, is dazed, does not perhaps recall what has just happened to him, tries to orientate himself, finds that he cannot see, and is quickly thrown into a condition of panic. It is just at this point that the greatest aid in prophylaxis comes in. The touch of a soothing hand and the hearing of a quiet, firm voice will immediately quiet the panic and give the patient confidence. No patient with cataract should ever be allowed to go through the first night after the

operation without a nurse sitting beside the bed. Even ward patients should be given this protection, and the special nurse employed for this purpose should be strictly enjoined never to leave the patient's bedside without first calling somebody to her place of trust. It is quite necessary that the nurse or attendant who has this watchful position should be able to converse in the language understood by the patient.

Pain after cataract operation is one of the factors in making a patient restless, and if the patient has been cautioned that undue movements may jeopardize the eye this restlessness may easily produce in the patient a condition of panic, so that no patient should be allowed to suffer pain following the operation. For the relief of pain and discomfort, which is very much more common following the numerous injections of procain hydrochlorid practiced at the present day to insure a painless operation, nothing has been so efficacious as the hypodermic injection of $\frac{1}{12}$ grain (6 mg.) of morphin with $\frac{1}{200}$ grain (0.3 mg.) of scopolamin. This may be repeated two or three times during the night if necessary. The pain is never so great but that the small dose of morphin will control it, and the scopolamin lessens a nervous tension which might later go on to a disordered mental state. Many patients are made apprehensive by the stories they have heard of the long enforced recumbent posture. Reassurance as to this before the operation, and the use of a bed rest ten or twelve hours after for the relief of backache, remove this source of mental distress. Turning the patient onto the unoperated side the first night gives much relief. These procedures, if carefully carried out, are not likely to harm the eye when the modern methods of handling a conjunctival flap are employed.

If, in spite of all these painstaking prophylactic measures, a patient does become demented, delirious or maniacal, what is the best form of treatment? There is nothing so efficacious and often so promptly remedial

as a removal of the bandage from the unoperated eye, particularly if the unoperated eye has sufficient vision for the patient to take in his surroundings and to see the face of the nurse or of some member of the family who has been called in. Most authors who have written on this complication of cataract work mention uncovering of the unoperated eye. This accounts for the freedom from postoperative mental disturbances which has been previously noted in ambulatory cases in which only the operated eye was covered.

Some of the later manifestations of mental disturbance may be warded off by allowing the patient to look with the operated eye on the third day and convincing him that he can see with it. The author frequently holds up a watch with a plus glass in front of the eye, often finding that the patient can tell time. This relieves his mind as to the ultimate outcome. Frequently, after such a convincing of the patient, there is an immediate relaxation in the nervous tension followed by a good night's sleep.

In one case of cataract removal in which a man had lost one eye from a golf injury and had had a high amputation of one leg following diabetic gangrene, it was necessary to take the dressing off from the operated eye on the third day and allow him to see around the room, which immediately quieted a very severe delirium. In this case, on the fourth day a strong cataract glass was put into the old frame of his glasses and applied, and this allowed him to see coarse print. Until these procedures were followed the patient had been most actively maniacal, using very bad language and requiring considerable restraint, though a preliminary iridectomy had been performed three weeks earlier with no after-trouble. In such cases the physician himself may be the only one who can control the patient.

Frequently, in a patient otherwise doing well, some accidental injury to the operated eye may produce a hemorrhage into the anterior chamber which temporarily

blots out the vision and throws the patient into a very depressed mental state. It is therefore extremely important that some efficacious protective dressing should be applied so that the patient cannot in any way injure his own eye. It is Greenwood's custom to keep the eye protected at all times when the patient is likely to fall asleep for at least three weeks after the operation, leaving the eye open and exposed only during the patient's waking hours and after the sixth day. In this connection it is well to point out the fact that attempts to put drops into the eye by inexperienced attendants are also fraught with the danger of opening the wound or causing a hemorrhage or an iris prolapse with the resulting extra mental distress.

The important thing after a cataract operation is to have some one beside the patient constantly who can reassure the patient as to his condition. Greenwood never allows a patient with cataract to be without some one beside him for the first forty-eight hours. Pain after a cataract operation may precipitate a restlessness on the part of the patient, and the use of morphin and scopolamin as used in general surgery for several years is here indicated. A subcutaneous injection of $\frac{1}{12}$ grain (5 mg.) of morphin and $\frac{1}{200}$ grain (0.3 mg.) of scopolamin produces a very comfortable twilight sleep. It is not necessary to make patients lie absolutely still more than a half hour after the operation. Allow a turn from side to side in the bed. Do not let them sit up on the way back from the table or for the first hour or two, but after that allow them to change their position in bed. There can be no objection, especially when a good conjunctival flap has been secured.

Sugar Tolerance and Hypertension in Cataract Patients. In many instances, cataract is discovered in patients who also have diabetes or renal vascular disorders, such as essential hypertension, arteriosclerosis and nephritis. These diseases most frequently occur at a time in life when cataract is most common. With the

exception of diabetes, they do not appear to have any direct bearing upon the etiology except that they are not infrequently associated with an increase of sugar in the blood.

Cataract does seem to be directly related to hyperglycemia in some instances. S. Weir Mitchell, while injecting large amounts of sugar into dogs, found that cataracts were produced in a number of the animals. Langdon, by reducing blood sugars to normal, completely arrested lens changes for three years in four patients and in one there was improvement in the lenticular condition. Joslin believes that cataracts must have a definite relation to the hyperglycemia, because they occur in young diabetics who have had the disease many years. F. M. Spalding and W. S. Curtis studied 307 successive cases of Joslin's series and found cataracts in 10.4 per cent. Baldwin and Barthell, in a series of 132 cases of cataracts, found the fasting blood sugar above 12 per cent in 99 cases.

E. R. Blaisdell[4] reports on the findings from one of the clinics.

The blood sugar tolerance was studied and the blood pressures recorded in one hundred patients with cataracts. With the exception of nine known diabetics, all were given 100 gm. of glucose on a fasting stomach and the blood sugar was estimated two hours later. Twelve patients had a carbohydrate tolerance below normal, while thirty-one patients had a systolic blood pressure above 150 mm.

Hypertension and low glucose tolerance do not seem to be contraindications for cataract operations, providing intelligent pre-operative and postoperative treatment is carried out. In this series, there was no patient with delayed healing or postoperative hemorrhage.

The number of cases studied is far too small for one to draw any conclusions as to the etiology of cataract, but the results obtained here, added to the reports from

(4) New England J. Med., April 11, 1929.

other clinics, indicate that the presence of low glucose tolerance and cataract in the same patient is more than a coincidence. Research workers and pathologists have taught us that certain organs of certain families are susceptible to certain diseases and that this susceptibility does not always show itself in the following generations. Given such a patient, predisposed to cataract, is he not more liable to develop the disease if his carbohydrate metabolism becomes impaired?

Chemical Analyses of Blood in Patients Having Senile Cataract. A study of the chemistry of the blood in patients suffering from senile cataract was undertaken by C. S. O'Brien and V. C. Myers[5] because they felt that since this type of cataract is always bilateral, it must be due to systemic changes. It was thought that changes in the blood might possibly point out lines of study which would eventually lead to a discovery of the etiology of these senile changes so frequently seen in the crystalline lens.

As far back as 1881, Cahn, in Hoppe-Seyler's laboratory, following some earlier observations of Jacobsen, reported data on the composition of cataractous lenses, in comparison with those of normal eyes. In lenses exhibiting cataractous changes the figures show a marked increase in all lipids: cholesterol, lecithin and fats. The increase in cholesterol is particularly striking, being 0.62 per cent per 100 parts of the solid residue in normal lenses and 6.22 per cent in cataractous lenses.

In the series of cases studied, the analyses included cholesterol, urea nitrogen, sugar and hemoglobin; a number of other determinations were also made which are not recorded here, namely on uric acid, chlorides, calcium, inorganic phosphates, carbon dioxid content and the *p*H, all of which were found to be essentially normal.

Chemical analyses were made on a series of fifty-four cases of cataract, and the blood was found to be

(5) Arch. Int. Med., September, 1928.

essentially normal except for cholesterol which was somewhat increased in 54 per cent of the cases.

The Retina and Choroid

External Exudative Retinitis (Coats's Disease). External exudative retinitis was described in detail by Coats in 1908, and now bears his name, being commonly known as Coats's disease. Lloyd enumerates a total of only eighty-three references to this condition in the literature from 1876 to 1928.

The etiology is obscure. Young people apparently in good health without significant antecedent history are affected, males more frequently. The disease is usually unilateral, of insidious onset and progress. Vision is gradually impaired and the visual fields encroached upon. The main mass of exudate is seen usually near the posterior pole, or at the side of the disk, or encircling the disk, or at the macula or obscuring the macula, or with long tongues or a combination of central and peripheral patches. The common cause of the general white effect is the elimination of the red color derived from the choroid. Complications eventually set in, retinal detachment or iris changes, cataract, secondary glaucoma; pain finally necessitating enucleation.

A brief review of the pathology in Coats's first case will state the typical features. There was a billowy retinal exudation. Vessels passed over the exudate. There were irregular dilatations and contractions of arteries and veins, and large hemorrhages. Many veins were coated with exudate.

The main histologic features were the presence of a partially organizing fibrinous exudate between the retina and the choroid. The inflammatory changes affected mainly the deeper external layers of the retina, and the choroid hardly at all, except where some adhesions had finally occurred.

In the outer layers of the retina were found infiltra-

tion with leukocytes, increase in fiber elements, loss of rods and cones, cholesterin spaces, phantom cells, giant cells. The fibrinous structure received its blood supply from the overlying retina where capillaries normally occur. The internal layers of the retina suffered, but the changes were those of secondary atrophy. The vascular changes occurred in four forms: (a) dilatations of the wall, (b) thickening and degeneration of the walls with obliterations of the lumen, (c) ensheathing of the vessels with leukocytes, (d) formation of new vessels.

According to Berg the primary conditions are changes in the blood vessels of the retina. These produce larger and smaller hemorrhages in and behind the retina, serous and serofibrinous exudations, and more or less extensive necrosis of the retina. As a reaction, proliferation of glia and pigment epithelium follows, with formation of new connective tissue on the inner side of the choroid and along the retinal vessels. This brings about adhesion between retina and choroid. (See Frontispiece).

Sidney L. Olsho[7] reports the case of a girl, aged 19 years, single. The mother died aged 36 years of an inoperable brain tumor, nature unknown but not luetic. The father, previously healthy, died aged 74 years of a stroke. The maternal grandfather and two aunts died of tuberculosis. The father's sister, the mother of a blind child which died in early infancy, was herself blind and died as a young adult. Several children in an uncle's family were lost young. Two brothers and four sisters are in good health. The oldest sister, aged 34 years, has a bilateral retinitis pigmentosa, said to date back to the age of 9 years.

The personal history includes appendectomy in 1928, with brief convalescence; and a fall in a faint in July, 1927, producing a lip cut but no head injury. No other past illness is recalled. At present the general health is perfect. Hemoglobin is 76 per cent, red cells 4,520,000,

(7) Am. J. Ophth., June, 1929.

and leukocytes 7,200 with polynuclears 62 per cent, lymphocytes 35 per cent, mononuclears 1 per cent, eosinophils 1 per cent, and basophils 1 per cent.

Wassermann, blood chemistry, urinalysis, *x*-rays of chest, sinuses, and head, physical examination, and two

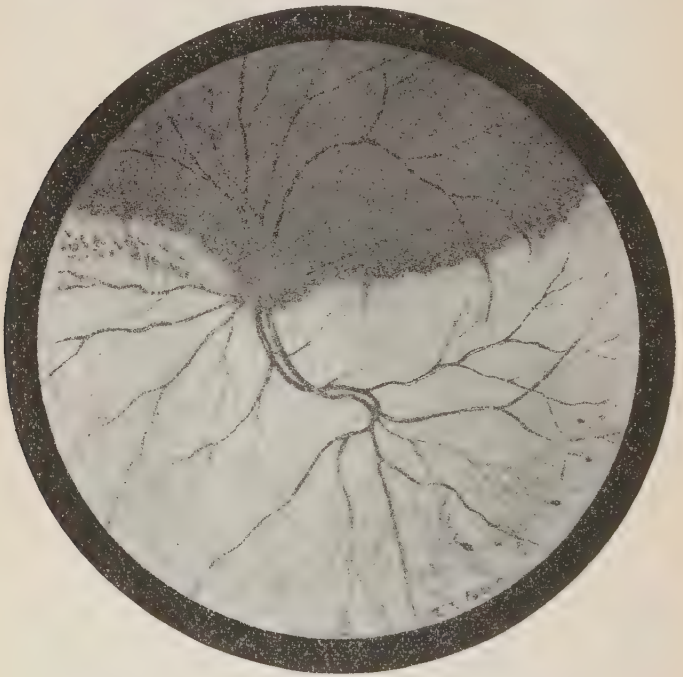


Fig. 27—External exudative retinitis, or Coat's disease.

Pirquet examinations were negative. Blood coagulation time was three minutes.

The family history brought to light several instances of disease of the nerve tissues, including brain tumor, retinal disease, and "blindness".

Coats suggests taking the coagulation time in all cases. A family history of tuberculosis is mentioned by authors. Observe the several instances here, some of them indefinite. Syphilis not a cause is here excluded.

Anemia is mentioned by authors. Note the low hemoglobin and a somewhat unusual differential white cell count.

Friends observed a peculiar bright reflex from the left eye about September, 1928. The patient first came

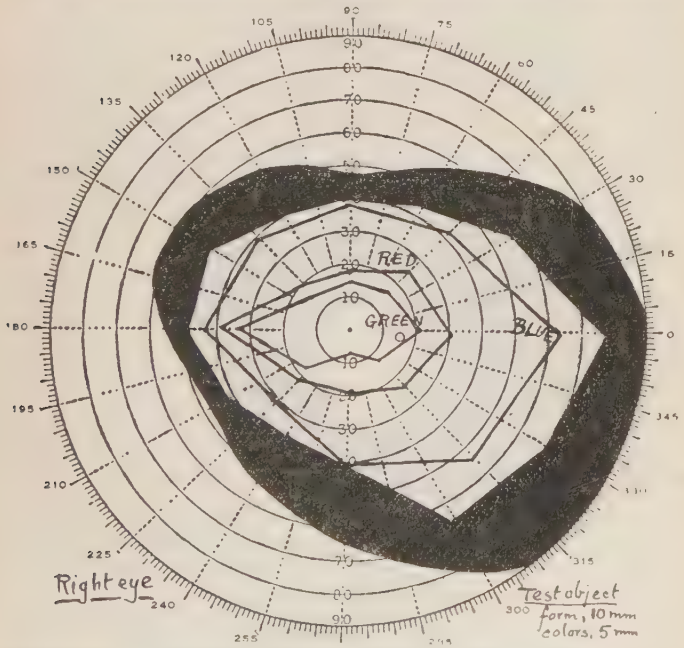


Fig. 28—A: External exudative retinitis. Visual field of right eye.

for consultation March 1, 1929, expecting glasses to remedy the defective vision recently noticed in the left eye.

The vision of the right eye was 20/15 plus; that of the left eye 10/200 in a restricted field. (See fields, Figures 27 and 28). The external appearances were normal except a peculiar light reflex from the left pupil. There was no resistance to backward pressure. Tension was 15 mm. Schiotz in each eye. The pupils were 4 mm.,

round, and equal; the right reacted promptly, the left poorly, to light. The consensual reflex right to left was good, left to right very poor.

Left eye: The nerve head is hazy in appearance. The edges are very poorly defined but the upper temporal

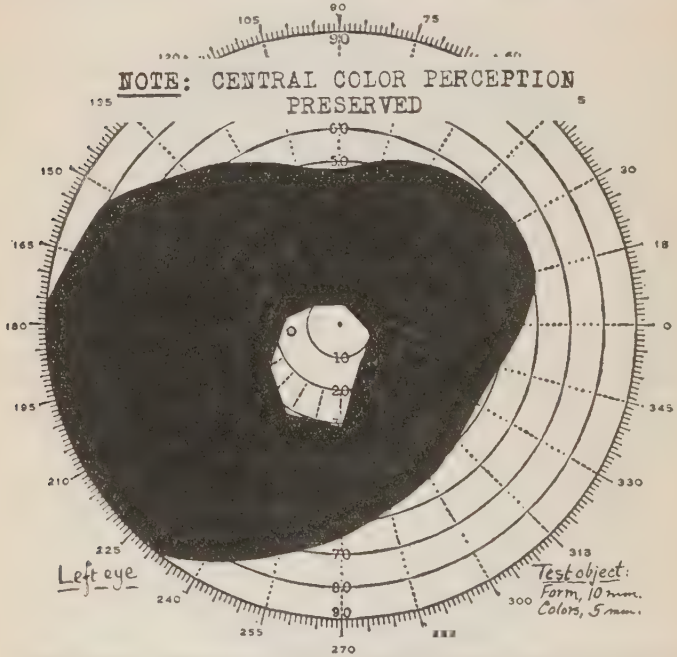


Fig. 28—B: External exudative retinitis. Visual field of left eye.

edge is discernible. The entire disk is cloudy. The vessels can be traced to the center of the disk, obscured by haze. They take the usual general direction. The veins are full, the arteries very thin.

The lower three-fourths of the fundus is seen as a homogeneous soft yellowish-white opaque surface raised almost uniformly about 1.5 D., extending as far as one can see toward the ora serrata except in one direction as will be mentioned. The upper limit of this surface

presents two borders, (1) a border extending from the margin of the disk upward and temporalward as far as one can see, and (2) a border extending from almost the upper margin of the disk slightly upward and nasalward, almost but not quite as far as one can see.

This thin superior temporal margin begins at the temporal disk margin one-fourth down with several indentations, and then continues upward and outward as a border of small undulations sharply defined from the nearly normal red fundus above.

The thin superior nasal margin of the yellowish-white surface originates in the hazy upper nasal quadrant of the disk and continues inward nasally as a border, first straight, then developing a number of undulations sharply defined from the nearly normal fundus above. This border presents some ovoid collections and streaks of very soft gray pigment slightly below its superior limit. Far to the nasal side the border becomes broken and is lost in an incompletely coalesced collection of yellowish-white islets.

This massive yellowish-white surface is almost of one color. A few very lustrous crystalline spots (cholesterin?) are seen in the lower temporal field.

The retinal arteries and veins pass in front of the yellowish-white surface and are free from haze except at points near and upon the disk. Some of the smaller branches can be seen passing over the edge from the nearly normal retina onto the yellowish-white area, and, contrariwise, small vessels pass on to the nearly normal retina without showing any appreciable bends.

There is no increase in the general vascularity of the fundus near the disk, but far down and far out near the five o'clock region peculiar vascular changes are noted. These are as follows: There is an increased number of good-sized venous and arterial branches. In one instance there is an anastomosis of a small vein with an arterial branch. The inferior temporal vein, traced far out, becomes extremely thin for a short distance and

then bifurcates. These bifurcations are extremely tortuous and present several small coils and one circumscribed glomerulus-like coil of new vessels.

The artery in this region has a tortuous course and terminates with a glomerulus-like coil of new vessels. There are quite a number of other small tortuosities and fusiform swellings in this region, as well as short coiled branches.

The yellowish-white surface beyond these vascular coils becomes billowy, and projects several diopters forward in a number of rolls of retinal detachment in which the ultimate terminal vessels are lost. This detachment is very far down and out to the periphery, too far out to see movement.

The Diagnostic and Prognostic Significance of Retinal Hemorrhage. Anatomically, retinal hemorrhages may occur in any of the layers of the retina. When in the nerve-fibre layer they have the characteristic flame shape. When in the deeper layers they are more or less irregularly round. In addition there are the so-called preretinal hemorrhages and subretinal hemorrhages. Preretinal hemorrhages lie between the internal limiting membrane and the nerve-fibre layer. Subretinal hemorrhages occur when the extravasations penetrate the external limiting membrane, appear among the rods and cones and spread between the retina and choroid.

The anatomical location of the hemorrhage is of great importance in making a prognosis as to vision. Preretinal hemorrhages, although frequently involving the entire macula, usually absorb with no impairment of vision. Hemorrhages in the nerve-fibre layer also frequently absorb leaving no trace. Hemorrhages in the deeper layers more frequently cause destruction of tissue and subretinal hemorrhages nearly always destroy the rods and cones and consequently the vision.

The location of the hemorrhage is also of importance in making a prognosis. A hemorrhage in the region of

the macula is naturally of more serious import than one at the periphery. Fairly large hemorrhages at the periphery even though destructive and even though they produce scotomata discoverable by perimetry cause very little disturbance of vision. Hemorrhages at the macula, however, present quite a different problem. A large superficial hemorrhage in the macula producing temporarily great impairment of vision usually absorbs completely leaving the vision normal, but it may leave behind organized exudate and permanent impairment of vision. On the other hand, deeper hemorrhages in which the prognosis is usually unfavorable may not destroy the rods and cones and therefore the vision after absorption may be normal. The whole question of prognosis in hemorrhage at the macula depends upon whether the rods and cones have been destroyed or whether organized exudate has been deposited in the fovea. This cannot be determined in advance by the ophthalmoscope. Therefore, the prognosis in hemorrhage in the macula should be very guarded lest we give too favorable or too unfavorable an outlook.

The primary cause of retinal hemorrhage in all cases except obstruction and injury is disease of the blood vessel wall. This disease of the blood vessel wall is due to some toxin circulating in the blood or to a deficiency of the blood itself as in the anemias. These toxins are produced by some general systemic disease. Therefore, when, in a routine examination of the eyes hemorrhages are seen in the retina, a thorough and complete physical examination is imperative.

Those diseases in which retinal hemorrhages are most frequently seen are: nephritis, arteriosclerosis, diabetes, anemia, leukemia and infective endocarditis. The obstructive causes of retinal hemorrhage are principally, thrombosis of the retinal veins, choked disk and during birth. In addition, retinal hemorrhages have been reported in influenza, typhus, typhoid, erysipelas, malaria, smallpox, measles, scarlet fever, gout, hemophilia and

scurvy. Then there are the recurrent intravitreous hemorrhages in adolescents which are hard to classify.

Frederick W. Lamb[8], who has died since this paper was prepared, describes the retinal changes, prognosis and treatment in these various conditions.

In the ophthalmoscopic examination of the retina, for hemorrhages, he found red-free light a very valuable adjunct. Small hemorrhages, invisible in ordinary light, are plainly seen when the retina is examined with red-free light. Even in some larger areas where the ordinary illumination shows only a slight difference in the color of the fundus and where the diagnosis of hemorrhage is uncertain, red-free light will at once clear the diagnosis. It is especially valuable in beginning choked disk revealing not only minute hemorrhages, but small exudates as well.

The use of red-free light in ophthalmoscopy was first described by Vogt in 1913, but its importance has not been generally recognized by ophthalmologists.

The Significance of Sclerosis of the Retinal Vessels. The familiar remark that the retinal vessels are the window of the arterial system, while in large measure true, needs qualification as far as its practical application is concerned. It is necessary to evaluate, in addition, such factors as various types of exudates in the retina, the presence of nitrogen retention, degree of systolic and diastolic blood pressure, and the usual other clinical data—so that as far as measuring prognosis is concerned, the problem for the internist is not easy. If he seek aid in the literature in the form of statistical evidence, he will find a discouraging diversity of opinion regarding the causes and prognostic importance of local retinal appearances, i.e., the state of the arteries, the appearance of the nerve head, and various types of exudates and hemorrhages.

He will find confusing views regarding the effect of the many manifestations of arteriosclerotic and kidney

(8) Ohio State M. J., December, 1928.

disease upon the retina and their significance. From the transiency of apparently fully developed fundus pictures auguring a distinctly bad prognosis, from the frequent alterability of local appearances and a host of other apparently reliable data, he may even be led to believe that sclerosis of the retinal arteries plays little if any rôle in the causation of exudates and hemorrhages, but that underlying all is a toxin of one kind or another. The situation is not helped any by the frequently observed transient narrowing of vessels and pouring out of exudates in case of toxemia of pregnancy, where evidence of sclerosis is lacking; and the temporary narrowing of vessels in transient hypertension. Nor does the occasional absence of visible retinal sclerosis in an otherwise typical so-called albuminuric retinitis help to clarify the matter.

The pathologist on his part is also beset with difficulties. As will be shown later, retinal arteries which appeared extremely narrow during life have shown either surprisingly little change or else change is much less pronounced than their clinical appearances would indicate.

Conversely, normal-looking arteries have shown unmistakable signs of sclerosis microscopically. Further, careful examination often fails to reveal the patches of exudate seen clinically. True, postmortem change or inadequate staining methods may be responsible, but undoubtedly the chief reason for this unsatisfactory state of affairs is the nature of the fundus lesion itself, affording as it does an unparalleled view of vessels and the results of constantly changing processes within their walls. Not that such processes are peculiar to the retinal vessels alone, but the mistake has been made of dogmatizing upon appearances due to factors little understood or which have not the significance attached to them.

By demonstrating some of the important changes in the eye-ground incidental to arteriosclerosis, and point-

ing out the early and late diagnostic criteria of this condition, the alterations in the presence of kidney disease, together with histologic appearance corresponding to them, David Wexler and Isadore Goldstein[9] offer a few pathologic observations to explain the most widely accepted views with regard to their interpretation along broad clinical lines, and to help to clarify the cause of local appearances in the fundus.

Several features concerning retinal changes deserve particular emphasis since they appear to have considerable basis of fact. First, the exudates are not the result of inflammation; no evidence of inflammatory process has ever been demonstrated; the term "retinitis," strictly speaking, is hence inaccurate. Secondly, as regards the origin of hemorrhages, bleeding into the retina is more in the nature of a capillary leakage and appears to have little relation to the height of the pressure in this part of the circulation which in these cases is probably below the normal level.

Hemorrhage from retinal arterioles is rare. Unlike the brain, where cerebral hemorrhage usually occurs in the larger sized arterioles, aneurismal dilatation is uncommon.

Probably most of our ideas regarding the significance of retinal changes are based upon a study of the fully established, typical-appearing fundus picture in the advanced arteriosclerotic or nephritic. Such cases, usually hospitalized, include hypertension with a breakdown in cardiac or renal function; and those with little or no rise in tension, the decrescent arteriosclerotic With a fairly accurate notion of the prognosis of each case dependent on other data, the presence or absence of retinal change does not entail such large measure of importance—the renal case without retinitis may offer the same poor prognosis as the one with retinitis. Of more importance, perhaps, is the pre-hospital group, seen by ophthalmologists and internist alike, where often

(9) Long Island M. J., April, 1929.

an isolated sign such as compression of a retinal vein by an artery, serves to focus his attention on the cardio-vascular system.

From the mass of data tending to show the importance of such findings, the most useful are the conclusions of O'Hare and Walker in 1924, concerning the relation of the retinal and peripheral blood vessels to the height of systolic and diastolic blood pressure. They appear to have established the principle, that regardless of the state of the peripheral vessels, advanced degrees of retinal sclerosis correspond to heightened general arterial pressure, and that regardless of the age group. Further, advanced degrees of systolic pressure carry with them corresponding degrees of retinal sclerosis. The notable exception to this rule is the decrescent arteriosclerotic, where lowered tension has supervened due to cardiac weakness. Slight or moderate degrees of sclerosis are often found in cases with or without peripheral thickening, but they stress the general rule that systolic pressures normal for this particular age group obtain in these cases.

A strict comparison between retinal and peripheral vessels is, hence, of little use. Structurally at least the retinal arteries correspond to arterioles; they are a better index of small vessels throughout the body than of vessels the size of the radials.

What of the dilemma then, in which the physician is placed by finding slight or moderate retinal sclerosis, where blood pressure for the age group is normal, where there is neither subjective or another objective sign of cardio-vascular disease? For may not the cerebral vessels be diseased, and is it not true that the state of the retinal vessels corresponds to that of the cerebral? The fact remains nothing definite can be said of the state of the cerebral vessels when those of the retina are but moderately sclerosed. The likeness, if any exists, holds only for advanced states of disease. That such an isolated finding is of value cannot be denied, in so far as

it focuses attention on a potential weakness, but its immediate importance is not to be overemphasized.

To come now to a grouping of arteriosclerosis from a fundus point of view, it is necessary to stress the retinal arteriole rather than exudates or hemorrhages as the one which offers the most information as regards the arterial systems. For regardless of the clinical syndrome, whether it be one or another type of primary hypertension, whether the latter be dependent on chronic nephritis, the retinal arterioles at one time or another are typical of the fully developed general arterial condition and that in relation to high blood pressure.

In hypertension consequent upon renal disease, retinal sclerosis if not marked by the time signs of general sclerosis are present, is full blown by the time extreme elevation of tension is established. Very frequently we have noted that where the systolic pressure fails to mount in severe renal disease, or does so to but a slight degree, retinal sclerosis is not only slight or even absent, but so-called albuminuric retinitis is absent. This is striking evidence of the dependence of the exudation of formed blood elements into the retina upon sclerosis, and relegates to a rôle of minor importance, at least in nephritis, such factors as azotemia and toxemia.

It is customary to speak of arteriosclerotic, diabetic and renal disease in the retina. Before attempting to distinguish these a pertinent remark by Duke-Elder should be quoted: He says, "In a tissue so highly differentiated as the retina it is only to be expected that different toxins acting upon it would produce pathological variations of a closely related type the nature of which would be determined rather by the structure itself than by the causal agent. Such is the inference one would draw were one to reason by analogy from the closely related effect of many, various toxins on another organ similarly specialized—the kidney." If the tissue changes in all be of a closely related type, but nevertheless ac-

countable for varying fundus pictures, it is also true that sclerosis is at the basis of them all. For even in diabetes with its so-called diabetic retinitis the sharply defined, waxy-looking exudates and the deep pin-point hemorrhages about the disk are absent if there be no sclerosis. Diabetic retinitis as a matter of fact, is never seen in the young, in whom the disease is often the severest.

The term "albuminuric retinitis," used to describe

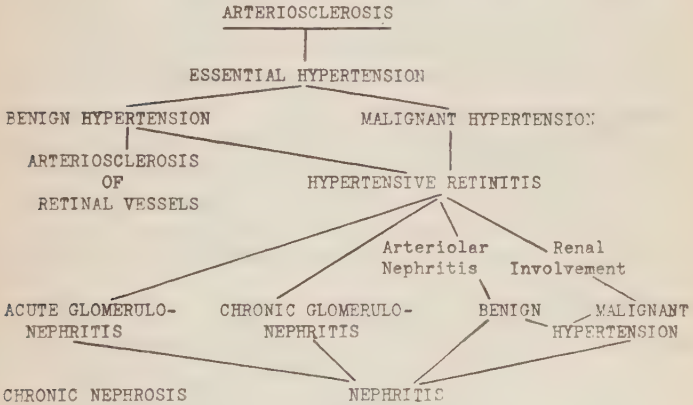


Fig. 29.

the fundus in advanced renal disease has so often proved unsatisfactory and indeed inaccurate, that it should be abandoned. The reason is simply the fact that the mere presence of albumin in the urine, besides being an inconstant index to renal disease, is a frequent finding in uncomplicated hypertensive disease. And if the meaning of the term be extended to include patients with azotemia, it is again inaccurate since many of these do not develop retinitis if the blood pressure be but moderately elevated. The term "renal retinitis" while somewhat better, is also misleading, since the syndrome of severe sclerosis, variously shaped hemorrhages and exudates, with or without neuritis or edema, may occur not only in advanced renal disease, but also at one or

another stage in any form of hypertension disease, benign or malignant. (Fig. 29)

Certainly in malignant cases in the young and middle-aged, without or before the supervention of renal involvement, the fundus picture is often indistinguishable from what we choose to call "albuminuric retinitis." The authors propose the term "hypertensive retinitis" to be used not only in cases of pure hypertension where hemorrhages or exudates or neuritis in any combination have appeared, but in the nephritides as well, as being the most inclusive and the most accurate description of the ultimate disease in the retina, the one most cognizant of the general state, and most enlightening from a prognostic point of view.

Thrombosis of the Central Retinal Vein. The case of a woman, 71 years of age, is reported by F. H. Rosebrough[1]. It was of sudden onset and vision was rapidly reduced as secondary glaucoma developed. The eye was enucleated about three months from the beginning of the attack.

Von Michel, in 1878, was the first to recognize the true cause of the ophthalmoscopic condition known as thrombosis of the central vein, by actually finding the thrombus in the vein. Complete obstruction of the central vein exhibits a very characteristic clinical picture, the most prominent features of which are a suddenly occurring, but usually not quite complete, blindness; arrest of the retinal circulation with high grade venous stasis and abundant retinal hemorrhages, a long and unfavorable course and the occurrence of secondary glaucoma in almost every case, at a later period.

The disturbance of vision can be of various degrees corresponding to the degree of interference of the retinal circulation. Light preception is seldom destroyed in the beginning and, even in the worst cases, a small remnant of vision is retained only to be gradually reduced by subsequent hemorrhages until it is finally lost through secondary glaucoma.

(1) Texas State J. Med., December, 1928.

The ophthalmoscopic picture is as follows: The optic disk appears dark red and can scarcely be distinguished by color from the surrounding fundus; its border is concealed by clouding of the tissue and, ofttimes, by hemorrhages. The arteries are narrow and pale and, even on the papilla, are often difficult of recognition, while farther away in the retina, they frequently disappear completely for long intervals as a result of the cloudiness of the retina and the many retinal hemorrhages. The veins, on the contrary, are greatly distended and tortuous; their color is unusually dark, sometimes of a reddish black hue. Hemorrhages upon the papilla as well as in the retina have the form of spindles and strokes, the latter resembling those from a paint brush. Their radial arrangement in the retina is indicative of their location in the nerve fiber layer. Small round hemorrhages are usually located in the nuclear layers of the retina. Large, irregular shaped hemorrhages ordinarily indicate a breaking through on the inner or outer surfaces of the retina and, occasionally, hemorrhages enter the vitreous, revealing themselves as flocculent, membranous opacities which hide the details of the fundus from view. The optic disk, although edematous, generally shows no visible prominence.

In the severe cases in which complete closing of the central vein is to be assumed, occasionally, after a considerable period of time, the hemorrhages will diminish and a slight improvement in the vision can occur. Further improvement rarely follows and a high degree of amblyopia remains. Complications, especially secondary glaucoma, frequently occur and destroy the remaining vision. When this occurs, the tension can quickly reach a high degree and the pain is great and lasting. Miotics, iridectomy or sclerotomy, are of little value, and, usually, enucleation becomes necessary.

Secondary glaucoma is so frequent in cases of complete closure of the central vein that, in practice, its occurrence must be counted upon. It is caused by a

hindrance of the drainage which is produced by a slowly progressing inflammation of the iris and sclerocorneal border, resulting in a blocking of the angle of the anterior chamber. This condition occurs some weeks after the beginning of the retinal disease, rarely as late as three or four months after the retinal thrombosis.

Other complications which may occur are iritis, detachment of the retina, and disseminated inflammatory areas in the choroid.

Cases in which both eyes are involved at the same time are extremely rare. It is not so infrequent that, after the lapse of one or more years, the other eye may be affected with hemorrhagic retinitis, without the severe symptoms of obstruction of the central vein. Generally, in such cases, there is present some other disease which predisposes to retinal hemorrhage such as Bright's disease, diabetes, syphilis, septic conditions and the like.

Pathologic Anatomy.—Coats believed that the condition is almost always due to the formation of a primary thrombus. The presence of inflammatory changes in the vein wall is variable; that is, in some cases it does not occur, and the condition has been found especially in old people with extensive endarteritis of the central retinal artery or its retinal branches. The cases occur chiefly in advanced life, often in patients with frank arteriosclerosis, more seldom in cases exhibiting valvular deficiency of the heart, but only exceptionally in the presence of disturbed cardiac compensation. Occasionally the condition occurs as a complication of bronchitis and emphysema, seldom in nephritis, and occasionally in diabetes. As a rule the general condition of the patient does not give any satisfactory explanation of the occurrence of a thrombosis of the vein, especially in the region of the head where the disposition to thrombosis, in general, is less. The regularity of the occurrence on one side only, speaks for the disturbance of the circulation, due to a local cause.

Bilateral Obstruction of the Central Retinal Arteries. A number of cases of this condition have been reported, a few of simultaneous onset, a larger number with an interval between the incidence of the condition in the two eyes. Frank Juler[2] reports the following case.

A man, aged 50, lost the sight of the left eye suddenly two days before. The vision was reduced to bare perception of light, white opacity of the retina at the posterior pole of the fundus was already present, and the macula showed the typical cherry red spot. The arteries were narrow. Two weeks later the white opacity of the retina had disappeard. The right eye with spherical—2D had 6/9 vision and its retinal arteries showed slight sclerosis. The blood pressure was high, 260/156, and chronic renal disease was present.

Five months later he came again, having lost the sight of the right eye suddenly five nights before. Its vision was reduced to finger-counting at one meter. The right disk was atrophic, the arteries were narrow with apparent obliteration in places, and the lumina of the veins were much interrupted. There was a cherry red spot at the macula, and some whitish specks in that region.

The work of Coats and others has made it more than probable that most of the cases occurring in elderly folk are due to endarteritis or thrombosis in the central artery itself, and that an embolus is unusual. Embolism undoubtedly does occur, and is probably the correct explanation of the condition when it is present in young adults who are the subject of mitral stenosis, congenital heart lesions, etc. Spasm of arteries, hemorrhage into the nerve sheath, and pressure on the nerve itself are other possible, but not so well authenticated, causes. In a number of the cases occurring in young people no cause can be detected from a general examination of the subject.

Frequently the condition of blocked central artery or

(2) Brit. M. J., Nov. 3, 1928.

vein has been noticed first on waking from sleep, and it has been concluded that, in the arterial as in the venous cases, this was suggestive of a thrombosis. In cases occurring in elderly persons with arterial disease this is likely to be the explanation, but it is possible for embolism also to occur during sleep.

Attention has been drawn to the not infrequent occurrence of cerebral hemorrhage, anginal attacks, and death during sleep, and this has been explained by experimental observations on the blood pressure in this state. It is found that there are two entirely different conditions in question in sleep: (1) sound sleep, with lowering of blood pressure, (2) disturbed sleep, dreaming, etc., which may be attended with remarkable elevations of pressure.

In sound sleep, lowering of the systolic blood pressure to the extent of 15 to 30 mm. at the end of two hours' sleep is found, rising gradually in the later part of the night's rest. In 39 patients with an average systolic blood pressure of 204, Brookes and Carroll found a fall of 44 mm. after two hours' sleep. Blume found falls of 15 and 21 mm. in normal persons, but falls of 31 and 39 mm. in persons with high blood pressure.

Disturbed sleep may cause remarkable elevations of blood pressure, increased heart action, changes in respiration, and various reflex effects. MacWilliam found in one subject an elevation of systolic pressure from 125 to 180, and of diastolic from 75 to 105, an increase much greater than that which was produced by ordinary muscular exercise.

These two types of sleep are of interest to ophthalmologists in that they may both have a bearing on the incidence of arterial block in the retina. In the first, ischemia may be brought about by the lowering of blood pressure in the presence of endarteritis with or without thrombosis; in the second, a sudden increase may dislodge a clot or a portion of valve vegetation as an embolus.

Is Treatment of any Avail in Recent Cases?—By treatment is meant the administration of amyl nitrite, massage of the globe, and paracentesis. Many cases have been reported as successful. As long ago as 1861 Alfred Graefe reported complete restoration of sight in a bilateral case after iridectomy. In another reported case, after massage of the eye, a retinal artery began to pulsate again forty-five minutes after a complete block. Harrison Butler has also reported a case of improvement in an embolic case by treatment. In a recent case, the author saw the patient two and a half to three hours after a central artery embolism. After amyl nitrite and vigorous massage, the vessels had resumed their normal appearance and the embolus had shifted on to a small branch. The white opacity of the retina had already developed, and it is too early yet to say what improvement of vision, if any, will be effected.

Even if no immediate improvement is noticed it is possible that early intervention may assist in some extension of the visual field, as is perhaps suggested by the following case.

The patient was a young man who had mitral stenosis and a blocked central artery; a small area escaped obstruction, being supplied by a posterior branch from the central artery or by a cilio-retinal vessel, but there was a macular "cherry" spot, surrounded later by white opacity. Three and a half hours after he had discovered the block his vision was finger-counting in the temporal part of his field. Treatment made no immediate alteration in his vision, but eighteen days later he was able to read 6/36, and three months afterwards he saw 6/24 with the affected eye.

In this case, then, some repair in the function of the retina was undoubted, and this presumably took place in the neighborhood of the edge of the opacity, which was close to the macula itself. It now seems agreed that the usual refilling of the retinal arteries and the occasional return of vision in that part of the field around the disk

are due for the most part to dilatation of capillary anastomoses between the choroidal vessels and the retinal arteries on the disk itself. The sooner this anastomosis is opened up the greater should be the area of the retina which is not completely atrophied by the ischemia, and such a dilatation is likely to be favorably affected by reduction of the intra-ocular pressure.

Retinal hemorrhages in central artery block are sometimes seen in the neighborhood of the disk, and are considered as due to the yielding of small capillaries, probably in the opening up of anastomoses. They might be considered as a contraindication to paracentesis. It is right, therefore, to give treatment to any recent case, but paracentesis should be avoided if hemorrhages are present.

How soon does the White Opacity of the Retina Appear?—De Schweinitz reports that he has seen the white opacity develop as he watched a patient with the ophthalmoscope ten minutes after sudden loss of vision. Of recent cases under the author's care opacity of the retina was developed in one patient when first examined two and a half hours after the onset of blindness; in another three and a half to ten hours after the onset, becoming fully developed during the following twenty-four hours; in a third it was well marked in nine to fifteen hours.

As is well known, it is usual for the vessels peripheral to the block to fill up after the initial collapse, and it is interesting to note in this stage how much finger pressure on the globe is necessary to produce visible pulsation in the arteries. It has been noted by several observers that pulsation beyond the block in central artery obstruction is not obtainable; collapse of the vessel may be obtained, but not pulsation. By some this has been given as a diagnostic sign of some importance in doubtful cases, but it is certainly not invariable, for pulsation can easily be elicited in a congenital heart case with embolism of the main central artery.

The Retinal Blood Vessels in Hypertension and Arteriosclerosis. From the earliest days of ophthalmoscopy onwards the effort has been made both by ophthalmologists and by internists to correlate the various fundal pictures with constitutional disorders. In relation to those retinal lesions that result primarily from diseases of the blood vessels the investigation has gone through several stages, each of which has contributed important facts to our knowledge. At first, interest was directed mainly toward the more dramatic features of the ophthalmoscopic picture—hemorrhages and "exudates," spots of various form and color—and the different types of "retinitis," diabetic, albuminuric, arteriosclerotic, and others, were described, together with the more aberrant and unusual forms, such as retinitis circinata, retinitis punctata centralis, and central senile chorioretinitis. These retinitides were found to occur so frequently in typical form as to warrant the hope that some special constitutional condition might be discovered which could be related causally to each retinal picture. Extensive clinical studies were, therefore, made and in some instances fairly close correlation has been established, sufficient to justify the adoption of such names as "albuminuric retintis" or "diabetic retinitis."

Even in these chosen instances, however, the correlation has been far from satisfactory. Cases which were ophthalmoscopically indistinguishable from "albuminuric retinitis" were found in individuals who had no renal disease, and innumerable instances of advanced chronic nephritis were seen in which the ophthalmoscopic picture did not resemble the typical form of albuminuric retinitis. These findings have led to the realization that the retinal hemorrhages and "exudates"—the quotation marks are used because most of the white spots seen with the ophthalmoscope are not, in fact, exudates but serous transudates and hyalin, colloid, or lipoid deposits—were to be considered as phenomena

of secondary and accidental origin, dependent in largest measure upon local vascular disease and local anatomical peculiarities.

With the realization of the fundamental importance of retinal vascular lesions a new set of investigations was instituted by many workers who reversed the earlier attack on the problem. Instead of asking what constitutional condition is most often associated with a given eye-ground picture, they inquired how often and in what degree does retinal arteriosclerosis occur in such diseases as chronic nephritis, hypertension, diabetes, and other conditions. Such investigations defined more clearly the ophthalmoscopic appearance of retinal vascular disease and disclosed the close parallelism which exists between general arteriosclerosis and retinal arteriosclerosis. This conclusion, while perhaps the most definite and certain that can be drawn in this whole domain, is still very unsatisfactory, for neither does retinal, nor does general arteriosclerosis constitute a single disease picture. One cannot but wonder whether the form and distribution of the retinal vascular lesions might not be closely related to the form and distribution of the associated general vascular disease and to its clinical manifestations. Among the problems which are suggested by this line of reasoning, the special questions which have, in the past, received most attention are the following:

(1) What are the retinal signs of vascular hypertension? (2) Does arteriosclerosis, as evidenced in the eye-ground, precede or follow the development of hypertension?

In order to pick out from the varied features of retinal vascular disease certain dominant elements, and to establish, if possible, the diagnostic and prognostic significance of these elements, Harry and Jonas S. Friedenwald[3] have for several years past been making a special study. Fundus appearances in approximately 2,000 cases

(3) Bull. Johns Hopkins Hosp., October, 1929.

have been observed and a summary of these observations and conclusions given. Cases of general vascular disease were sorted into the following groups, with respect to the ophthalmoscopic findings (Fig. 30):

Fig. 30—Composite drawing illustrating various types of retinal vascular lesions.

1. Hypertension without retinal arteriosclerosis.
2. Retinal arteriolar sclerosis and albuminuric retinitis.
3. Retinal arteriosclerosis with hypertension.
4. Retinal arteriosclerosis without hypertension.
5. Syphilitic arteriosclerosis.
6. Retinal arteriosclerosis resulting from local disease.

This classification which is based essentially upon the eye-ground findings is not without clinical significance.

Hereditary Angiomas of the Cerebellum and Retina. Recent work on cystic hemangiomas of the cerebellum has brought to light a clinical syndrome that has hitherto received no general or accurate recognition. From a pathological study of two cystic hemangiomas of the cerebellum Lindau,[4] of Lund, was led to search for similar specimens in the various museums of Europe, with the result that 15 unreported examples were assembled. In examining the postmortem records he was impressed by the frequency with which the cerebellar cyst was associated with angiomatous and cystic lesions in other parts of the body. The lesions found included cysts of the kidneys and pancreas, adenoma of the adrenal gland, and angiomatous tumors in other parts of the nervous system. In one case it appeared that the patient had had one eye removed eight years before death for what was diagnosed as arteriovenous aneurysm of the retina. The eye had been preserved, and when it was cut and examined histologically a small capillary angioma of the retina was discovered. By this interesting disclosure Lindau was encouraged to study angiomatosis of the retina, a rare malady with a familial tendency, and he found that approximately 20 per cent of the patients suffering from this condition had been known to have intracranial complications. Since the publication of Lindau's paper several additional cases have been reported in which cystic hemangioma of the cerebellum was associated with cystic and angiomatous lesions in other parts of the body. Cushing and Bailey re-examined the eyes of six cases of hemangioma of the cerebellum that had been operated on at Cushing's clinic in previous years, and in one of these cases they found an unmistakable angioma of the retina that had been overlooked at previous examinations. Detailed inquiry into the family history of this patient disclosed that the

(4) Lancet, Dec. 22, 1928.

father and one aunt had died of "ruptured cystic sarcoma" of the brain.

The discovery of angioma of the retina in a patient who is suspected of suffering from intracranial tumor may now be said to have a distinct significance; it suggests that the patient has a cystic hemangioma of the cerebellum, a benign lesion that can be removed at operation. As Cushing's case shows, the retinal angioma may be overlooked. It usually lies in the peripheral part of the retina, and it may give rise to changes, such as cyst formation, detachment of the retina, hemorrhages, and retinitis proliferans, all of which render the primary lesion obscure. Fortunately, however, the retinal vessels passing from the optic disk to the tumor are excessively enlarged, and the artery often has a varying calibre. Such appearances call for careful examination of the peripheral retina.

Although the observations are still few in number, there is little doubt that Lindau's syndrome is a hereditary affection. Hitherto the information that any disease is hereditary has usually come from patients whose sphere of observation is limited to diseases, such as hemophilia, that are easy of recognition. Among diseases that cannot be diagnosed by lay observers, there must be many in which heredity plays a part, and it is legitimate to expect that the more accurate pathological investigation and documentation of cases during recent years will furnish, as records accumulate, more and more evidence of the influence of heredity in disease.

Glioma. Glioma of the retina is a malignant, nonpigmented, intra-ocular tumor, in which the rapid growth, extreme malignancy of the tumor and the youth of the patient are the outstanding clinical features. According to Wintersteiner-Parsons, glioma retinae comprises about 0.04 per cent of all diseases of the eye. Sex has no influence on the incidence of the disease. Either eye may be affected and it is bilateral in 25 per cent of the cases The growth in the second eye is an inde-

pendent focus, and there is no extension of the disease through the chiasma. The number of cases decreases with each added year of life, until the age of sixteen is reached, after which glioma retinae has not been known to occur. Two-thirds of the cases occur before the fourth year of life. It has been congenital. A gliomatous tendency seems to lurk in some families. Several members of the same family may be affected; parents and offspring, brothers, sisters, cousins.

The cause of glioma retinae is unknown. Wintersteiner, in his exhaustive research, concluded that the tumors were the result of misplaced cells of the outer layers of the retina. Trauma and inflammatory attacks have been held as predisposing causes, but such is hardly possible.

Glioma retinae passes through three stages; (1) the period of intra-ocular growth; (2) secondary glaucoma; (3) extension to surrounding tissues with metastases to distant viscera.

The period of intra-ocular growth is devoid of symptoms, except the loss of vision, which may be noticed by the parents; and a peculiar reflex from the pupil (amaurotic cat's eye—Beer). The retina may become detached during this period and found that way should the patient be brought to the surgeon.

The second stage (glaucomatous) of the disease is usually of sudden onset. It is at this time that most of the patients are brought to the surgeon. There is present all of the symptoms of glaucoma: namely, increased intra-ocular tension; congestion of the pericorneal blood vessels; pain in and about the eye; edema of the cornea; with reduced or lost vision. When the ocular fundus can be seen the tumor will be found. In an occasional patient we will find a hazy aqueous humor, or deposit of cells in the lower part of the anterior chamber (hypopyon). The other eye should be subjected to a thorough search for tumor masses.

Unless the globe is removed early, gross changes will

take place due to the increased intra-ocular pressure and necrosis of the tumor. There will be atrophy of the choroid, ciliary body, and iris, with hemorrhages and thrombosis of the intra-ocular blood vessels. Stretching of the cornea and sclera will occur in time unless the eyeball is perforated. It is now generally agreed that the reverse process, shrinkage of the eyeball, does not occur until the globe has been perforated by the tumor. Phthisis bulbi should always be sectioned and examined for intra-ocular neoplasms. When these are found, they are usually melanotic sarcomata.

Before all of these changes take place the condition invariably has passed into the third and last stage; that of direct extension to the adjacent tissue with metastases. Whenever we find the tumor has invaded orbital structures it is a certainty that distant viscera are also invaded.

Perforation often occurs at the limbus first; next, about the venae vorticosae, and last around the optic nerve. Metastases occur by direct extension along the optic nerve to the orbital tissue and brain; through the lymphatic system and blood stream to distant viscera.

The conditions to be differentiated from glioma of the retina are:

1. Simple detachment of the retina. This rarely occurs in childhood. When detachment without tumor formation occurs, the retina is a gray or bluish tint, devoid of the formation of new blood vessels, and the surface is irregularly displaced in the vitreous. The tension will be normal or reduced. If the globe is enucleated section of the globe will decide the question.

DeSchweinitz and Shumway gave detachment of the retina with dropsical degeneration of the rods and cones as resembling glioma.

2. Tumors of the Choroid. A flat detachment of the retina suggests tumor of the choroid, but the surgeon will scarcely ever be able to differentiate between sar-

coma and glioma in a child until histological study is made. The primary tumors of the choroid are leukosarcoma (white), and melanosarcoma (black).

3. Pseudo-gliomata. By this term is meant masses in the interior of the eye resembling glioma but not of neoplastic origin. They are the ones most frequently causing error. Whenever in doubt, the eye should be enucleated.

Acute and chronic suppurative hyalitis would head this group. Acute suppurative hyalitis has the history of recent injury, the acute inflammatory symptoms, with brief course until there is a show of pus. Chronic suppurative hyalitis follows the acute infectious diseases. There are no new vessels on the surface of the mass, and the latter is smooth instead of nodular. Histological study will show necrotic cells making up the vitreous body with inflammatory findings throughout the remainder of the globe.

4. Wintersteiner mentions cysticercus to be differentiated from glioma. This condition is rare in America, frequent in Australia and New Zealand, a bluish white mass in the interior of the eye, without blood vessels, normal tension, vision reduced or destroyed and inflammatory symptoms. The cysticercus can often be seen with the ophthalmoscope.

D. A. Bartley[5] gives an interesting history of this disease from the time it was first recognized, in the latter part of the Renaissance period, and after describing more fully the chief characteristics of the pathological condition, gives the clinical history of seven cases that have come under his observation. Of these, the first has beyond doubt passed the period of danger (four years) following enucleation. Two cases, seen in 1925 seem to be in a fair way for complete recovery without recurrence.

Of two cases that died, a small seven months' old baby had a very malignant, rapidly growing tumor, which,

(5) J. Indiana M. A., June, 1929.

judging from the history, was there before birth. The other child who died was clearly a case of neglect. This author concurs in the generally accepted belief that glioma of the retina seems to be fairly amenable to treatment if an early diagnosis is made, and the eye promptly removed. But on the other hand, death seems the only result in those cases in which removal of the eye is postponed until there are definite pressure and pain symptoms.

A case of familial glioma retinae is reported by W. G. Sym[6]. A boy nine months old was operated upon by the late Argyll Robertson for glioma of the left retina. He recovered and grew up; he married, and had four children. Of these the first was described as stillborn. The second child (first living birth) and the following, a girl and a boy, both died of double glioma at the age of approximately 4 years. The father absolutely refused to allow operation, although without operation he would never himself have grown up—but perhaps from the racial, if not from the individual, point of view he may have been wiser than we were. The fourth child, when last seen as a little girl of 3, was apparently quite healthy. She was a posthumous child, for in the meantime the father, who had been serving in France in the army, was sent home ill and died of multiple intracranial new growths.

It seems more than strange that an infant rescued from death by glioma should have grown up to procreate four children, of whom two at least died of that disease; and that he himself should then have died of it at the age of 27.

Gliosarcoma of the Retina. In the following somewhat rare case reported by E. C. Hudson[7], the patient was carried a distance of 30 miles, probably on foot, by the parents, from whom the history was elicited with

(6) Lancet, Nov. 3, 1928.
(7) Lancet, Sept. 22, 1928.

difficulty as they were very ignorant and poor villagers. (Fig. 31).

A Hindu (Bengali) female child, aged 3, was first seen on March 17, 1928. She had been born normal with perfect eyes, and there was no history of any injury.

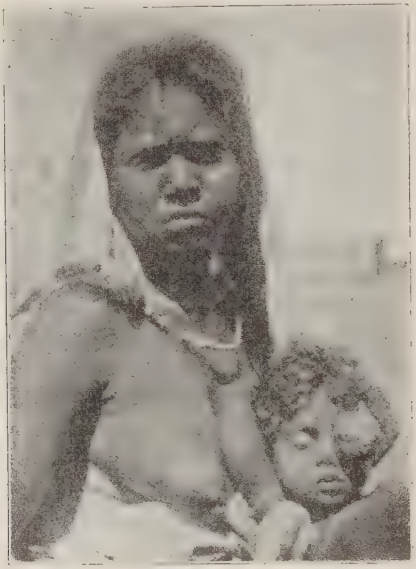


Fig. 31—Hindu child. Intact but over-stretched margin of eyelids formed into a ring. Two large circular fungating ulcers. The mother with plenty of milk was still suckling her only child at 3 years.

Four months before admission her eyes had begun to "water"; then the left eye became red and, later, cloudy. The left eye was said first to have retracted for about a month; then it began to bulge.

When brought to hospital the child was so irritable that gr. 1/12 morphia had to be given hypodermically before examination, but the tumor did not seem particularly painful. The left eye was found to have been completely destroyed by an ulcerating tumor, the size

of a lemon, protruding from the orbit and evaginating the palpebral conjunctiva. The eyelids were intact but greatly stretched. The tumor was firm and fleshy with a feeling of resilience. The child was otherwise normal and in fair condition (feeding on rice, etc., and still suckling from its mother). The right eye was sound and there were no signs of any secondary deposits elsewhere in the body, glands or otherwise.

Treatment.—Complete exenteration of the orbit, as far as possible in one piece, was performed under a general anesthetic (A.C.E. and ether) on March 22. It was a difficult operation on account of tension of the orbital contents and the advisability of removal in one piece intact. The external canthus was slit to give greater freedom for extraction. No operating gloves were used. During the removal a cystic portion burst and a semi-fluid exuded in the form of soft, lumpy, glial contents of a crushed blackberry color, suggesting degenerating tissue stained by blood. This came from the upper and medial quadrant of the tumor, slightly decreasing its volume and so facilitating extraction. The greater portion of the tumor was fairly firm. There was no invasion of the orbit and the periosteum was stripped clean everywhere up to the margin. The growth appeared to have extended backwards along the optic nerve to the base of the brain through the optic foramen, as the optic nerve was somewhat pulpy. The nerve was cut through as far back as possible. There was little bleeding of the stump, and this was controlled by hot saline flush and pressure pad, as artery forceps proved of little value. The redundant overstretched eyelids were then trimmed and the cilial margins cut away. The orbit was packed with gauze soaked in acriflavine and liquid paraffin mixture.

The child had a reactionary postoperative temperature of 101 F. the same evening, which had dropped to normal the next day, rising again to 100 F. on the third day, and thereafter normal until an incidental

attack of dysentery set in and passed off after treatment.

The first dressing was carried out under general anesthesia on the third day, when the stump of the optic nerve was cauterized with pure carbolic acid and a ribbon gauze dressing of acriflavine and paraffin repeated. Thenceforward similar daily dressings of very light packing after irrigating with electrolytic chlorin were carried out for about 14 days, when acriflavine and paraffin were discontinued.

The child made much better progress than was expected considering the primitive aseptic and antiseptic conditions in a new hospital in the jungle 22 miles from the railway. The parents, against medical advice, took the child away 31 days after the operation, before the wound was healed or a skin graft had been attempted. Nothing has been heard since.

Melanosarcoma of the Choroid. The most common types of neoplasms of the choroid are the melanosarcoma and leukosarcoma. The pigmented growth according to Rockliffe predominates in the ratio of eight to one. Ofttimes it is hard to differentiate between melanosarcoma and leukosarcoma, because growths appearing white macroscopically will be found pigmented upon microscopical examination. A growth which is deeply pigmented while intra-ocular may be unpigmented when it becomes extra-ocular or metastatic. The pigment is usually due to melanin, although in some cases it may be hematogenous.

Writers have classified sarcoma into four periods: First, the relatively quiet period manifesting itself only by retinal detachment; second, the inflammatory or glaucomatous stage, based upon the congestion which the tumor produces in the veins of the choroid and by which increased transudation of fluids takes place into the interior of the eye; third, the extra-ocular stage in which neighboring structures are implicated by extension along any of the channels in the sclera, penetrated

by vessels and nerves; fourth, the metastatic stage in which distant organs through embolism are attacked by growths of similar histological character.

The growth which develops from the outer layers of

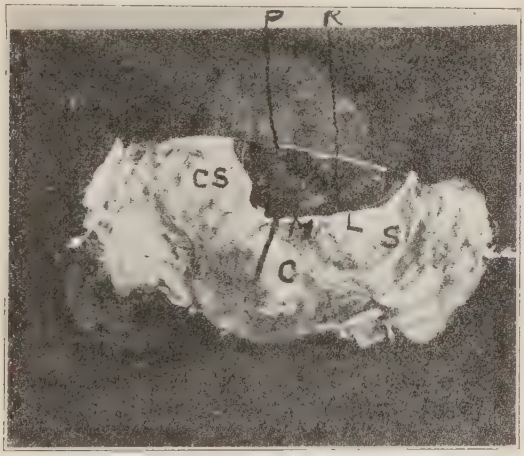


Fig. 32—Section through portion of orbital melanosarcoma and eyeball, looking anteriorly, showing C, surface section of orbital neoplasm; S, layers of sclera split off from remaining lamellae; L, of sclera; R, retina detached by M black melanosarcoma of choroid and P, ciliary processes.

the choroid is usually primary and unilateral. Often it is manifested by the formation of a definite tumor and is designated as the nodular or circumscribed type. However, in rare instances, the growth spreads laterally extending along the perivascular lymph spaces, infiltrating and thickening the choroid, known as the diffuse or flat type.

G. H. Poos[8] reports a case of this latter variety, in which the tumor originated in the choroid with a splitting of the sclera and spreading along the emissary vessels to the adjacent parts. There was extensive involvement of the extra-ocular structures including the orbital wall of the posterior ethmoids and maxillary sinuses.

(8) J. Missouri M. A., July, 1929.

(Fig. 32) About seven months after the exenteration, followed by radium and *x*-ray therapy, there was a recurrence. (Fig. 33)

The Optic Nerve

Acute Retrobulbar Neuritis Caused by Inflammation of the Sphenoid Sinus. Few subjects in ophthalmic literature have been more discussed in the past twenty years than this, and, although acute retrobulbar neuritis

Fig. 33—Recurrence of melanosarcoma.

due to a hidden, nonpurulent inflammation of the sphenoid is accepted as a clinical fact, there are many phases to the subject, especially in reference to pathology of the sinusitis, the mode of infection, and the treatment, that are still moot questions. W. Blake Gibb[9] calls attention to the close relationship that exists between the sphenoid and posterior ethmoid sinuses and the optic canal. Knapp says that an examination of 100 skulls showed that in 38 per cent only a thin wall of bone, varying in thickness from 1-2 mm., separated the sphenoid from the optic canal. In fact, the separation may be of only parchment paper thickness, and

(9) J. M. Soc. New Jersey, March, 1929.

the optic nerve has been found actually traversing one of the posterior ethmoidal cells.

The pathologic nature of the inflammation of the sinuses has been generally regarded as a hyperplasia, that is, an excessive formation of connective tissue produced by a chronic, low grade, localized inflammation. McCollum, in his textbook on pathology, describes both hypertrophy and hyperplasia as an increase in bulk of the tissue, but hypertrophy is a term used to indicate an enlargement and strengthening of an organ brought about by an increase in the size of its elements, while hyperplasia, on the contrary, is the result of increase in the number of these elements or cells. Again, Vail states "hyperplasia of the sphenoid or ethmoid bone is a rarifying osteitis associated with inflammatory swelling and fibrous thickening of the mucous membrane lining their cavities, causing edematous tissue to fill them without the formation of pus; the limiting wall, called the capsule, is also thickened and the orbital wall is involved as well as the nasal."

What is the mode of infection? Peters felt that the inflammation spread to the nerve by two methods, first from the sinuses through direct extension to the nerve; second, by means of the posterior vein of Vossius, which receives tributaries from the nose and posterior part of the orbit and enters the optic nerve in the optic foramen, occupying in it a central position and passing back toward the chiasm. He showed that production of the enlarged blind spot could be accounted for by direct extension affecting the peripheral portion of the nerve which supplies the area of the retina immediately surrounding the disk, and that the central scotoma was caused by toxic material carried through the blood stream to the papillomacular bundle in the center of which lies the vein of Vossius.

Many rhinologists do not share the opinion of the ophthalmologists that operation on the sinuses is indicated or justified in cases of retrobulbar neuritis when

nasal examination is negative. Herzog has shown that the optic nerve is involved, not necessarily by destruction of the intervening bony wall, but by extension of an inflammation along the medullary spaces in the intact bone from the sphenoid cavity to the optic nerve sheath. He believes that this inflammation extends along vessels and lymph channels through the medullary spaces in the intervening bone, producing an inflammatory edema of the optic nerve sheath. This edema of the nerve sheath acts like a catarrhal inflammation which responds favorably to the action of cocain and adrenalin by shrinking. This, possibly, explains why some cases recover without operative treatment. The results of these later investigations by Herzog have met with the approval of many of the foremost ophthalmologists and rhinologists.

Symptoms.—The patient seeks the ophthalmologist complaining of a sudden reduction of vision in one eye. Things appear "foggy" to him and as time goes on the condition becomes progressively worse so that, in severe cases, in a few days even light perception may be lost. Headache is a frequent symptom and is usually referred to the back of the eye, often made worse by pressure on the eyeball. Pain on extreme movement of the eye is occasionally complained of. The pupil of the affected eye is usually larger and responds to light sluggishly, returning to its original size after a short period while still under the direct stimulus of the light. In severe cases, the pupil is decidedly larger than its fellow and pupillary reflex is lost. The fundus usually appears normal at first but later there is some blurring of the disk and tortuosity of the vessels. In rare cases, a definite papillitis has been observed. Fields are most important and are of diagnostic value. They are best taken on a screen, the Thomassen modification being a very suitable type. The characteristic feature is the presence of a central scotoma. This scotoma may vary in size, being separate from the blind spot or including

it. In severe acute cases, the peripheral fields may also be obliterated. Production of this central scotoma is probably due to pressure of the edema of the optic nerve sheath on the nerve itself. As this pressure is felt equally in the center of the nerve and on the periphery, the delicate and sensitive fibers supplying the mascular region are first affected. An enlarged blind spot is occasionally present, and is a constant sign in chronic cases.

Among other conditions which have to be differentiated from this are toxic amblyopia, congenital amblyopia, hysteria, malingering, multiple sclerosis, and optic neuritis from focal and systemic infection. The cases of toxic amblyopia will give a history of slow onset, of over-indulgence in drinking or smoking, or the taking of large doses of quinin; small central scotoma for colors will be found and the loss of vision is not confined to one eye although there is a difference in degree between the two eyes. In congenital amblyopia, there is usually a history of poor vision for a long time in one eye, but sometimes it has just recently been discovered; on examination, a considerable error in refraction of that eye will be found; the condition is also not a progressive one. Hysteria may be recognized by the history and the typical tubular fields. Malingering may be detected by careful tests used for this purpose. Usually in multiple sclerosis, both eyes are affected, there is a peculiar nystagmus on fixation, and the presence of a paralysis of one of the extremities, with a fine tremor. However, sometimes the differentiation is very difficult, and more than one case has been operated upon which later developed multiple sclerosis. Optic neuritis following systemic infections will give a history of scarlet fever, typhoid, or some other acute, infectious disease, and both eyes will frequently be involved. A careful examination of the urine will rule out an optic neuritis due to albuminuria or diabetic affection. After focal infections, such as diseased tonsils or apical ab-

scesses, the reduction of vision is not so progressive, the fields do not show a central scotoma, and as a rule, there is a definite neuroretinitis. In some cases, when in doubt, a radiogram will be required.

Finally, as a confirmation of the diagnosis, a careful *x*-ray examination of the sinuses should be made and interpreted by a competent roentgenologist.

Treatment.—Of late the tendency in these cases is not to operate. Many leading ophthalmologists and rhinologists feel that these cases do just as well without operation. The theory that the cause of the neuritis is due to an inflammatory edema which yields to the action of adrenalin leads to the question, why not treat these cases medically. Hirsch, in his book, advises that the mucous membrane of the nose be contracted by the use of adrenalin followed by argyrol tampons. This treatment is to be repeated frequently, but, if at the end of a few days, there is no improvement, then the sinuses are to be opened. In the author's experience, while working out the diagnosis and suspecting a sinusitis, he always orders an adrenalin spray (1:4000) to be used every 3 hrs., but the moment an acute retrobulbar neuritis secondary to an infection of the sphenoid or posterior ethmoid, is decided upon, immediate operation on those sinuses is advised. Palliative treatment, while it may relieve at the time, leaves the patient open to recurring attacks which may be far more disastrous and less responsive to treatment either medically or surgically.

The author urges the necessity of early diagnosis of these cases, careful and frequent use of the screen to measure the fields and note progress of the case, and sincere cooperation with the rhinologist and roentgenologist in arriving at a diagnosis and method of treatment.

Reports are given of two cases.

Where it is seen, as proven by subsequent operation, that a sinus infection exists, and is the cause of the

neuritis, an anomalous development of the sphenoidal sinuses and the posterior ethmoidal cells may greatly hinder the surgeon in attempting to drain the infected sinus, on the accomplishment of which, depends, largely, the saving of sight and possibly the averting of very grave sequels.

When the infected sinus is anatomically normal in development—that is to say, when the two sphenoidal sinuses are bilaterally symmetrical with a medial septum dividing the right from the left—the diagnostic location of the focal infection is relatively simple, and then the opening and draining of the infected sinus is fairly straightforward. Unfortunately the anatomical development of the sphenoidal sinuses and the posterior ethmoidal cells is very frequently most irregular, for one sphenoidal sinus may be very large, while the other is small, much undeveloped, and, so to speak, so tucked away as to occupy a small corner difficult of access. Again, the posterior ethmoidal cells may be exceptionally large, and extend back so as to occupy the space proper to a sphenoidal sinus; they may even extend backwards above the corresponding sphenoidal sinus, which then lies beneath the backward extension of its posterior ethmoid cell. When healthy, such abnormal anatomical conditions are immaterial, but when infected the actual location of the diseased sinus may be a matter of supreme importance, for although an infected cell be small and extraordinarily undeveloped, it may be large enough to breed millions of pyogenic organisms.

In two remarkable examples reported by P. Watson-Williams[1], a method, termed by him the "differential test," by which the difficulties mentioned may be circumvented, is well illustrated in the accompanying diagrams (Figs. 34 and 35). He believes it would have been impossible to have detected the highly virulent

(1) Brit. M. J., Dec. 8, 1928.

focus of streptococcal infection in his case, except by this diagnostic procedure.

Optic Neuritis and Dental Sepsis. A case is reported by E. Temple Smith[2] of a man who consulted him because for three days previously he had been conscious

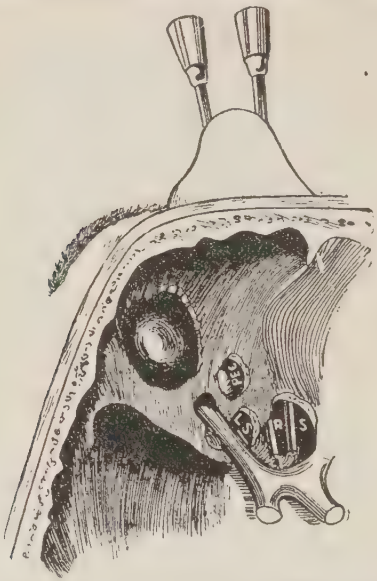


Fig. 34—One cannula passed into the sphenoidal sinus through right nasal passage, and another through left; owing to abnormal over-developmet of right sinus both cannulae have entered this sinus; the small ill-developed left sinus has been missed. Proof of this is afforded by attaching the syringe to one cannula and quickly injecting sterile water, which appears escaping from the free projecting end of the other cannula.

of "a black cloud" in the outer field of his left eye. There was no gross field defect. He had one diopter of hypermetropia with slight astigmatism. The vision in each eye with correction was normal (6/6). There was no central scotoma. Young's "threshold" test (a very delicate one) for light difference was negative. The macula was unaffected, but the nasal edge of the left optic disk was "fluffy." So far, then, there was

(2) Brit. M. J., July 20, 1929.

nothing much to be found abnormal beyond his consciousness of a cloud in his left field.

On examination of his central field with the Elliot scotometer the blind spot of Mariotte was found to be much enlarged, with snail-track extensions towards the fixation point and one or two isolated scotomata (Fig. 36). The average normal blind spot is marked by cross-

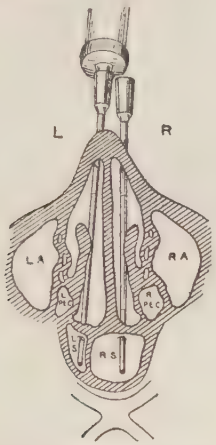


Fig. 35—By directing the left exploring cannula more outwards, it has been made to enter the small left sphenoidal sinus previously missed. Consequently, the two cannulae being now in separate cavities, water injected through the one obviously cannot escape through the other. Hence the proof of having entered both sinuses, one over-large, the other abnormally small.

hatchings for comparison. This, in conjunction with the hazy nerve-head, pointed to optic neuritis. It was evidently not of the usual toxic type met with in tobacco and some other poisonings, where the papillomacular bundle of nerve fibres is affected first, and macular vision with color impairment is a very early symptom.

The patient, a watchmaker, aged 35, was a non-smoker, the urine was free from sugar and albumin, and syphilis could be virtually excluded. His breath was foul, and examination by a laryngologist showed a tonsil with stale secretion in one of the crypts; this was

evacuated. Five days later the vision had fallen from 6/6 to 6/12, and there was slight loss of central color perception. His teeth were examined radiologically, although they appeared sound to the eye except for some pyorrhea of the lower incisors. He had root fillings in

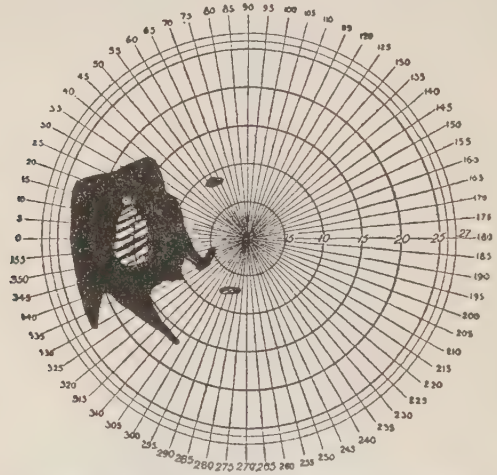


Fig. 36—Central field of left eye, showing enlarged blind spot and scotomata. The cross-hatched area represents the normal size of the blind spot of Mariotte.

two upper bicuspids; the film showed probable septic trouble at the apices of these teeth. His dentist extracted them both, finding a broken-down granuloma at the root of one; he also extracted the lower incisors.

Thirteen days later vision in the left eye had improved to 6/9 partly. The relative central scotoma was still present. His next visit was seven weeks later, during which time his mouth had been dealt with antiseptically. His vision was now 6/6 easily, and there was no central scotoma. The blind spot enlargement and the two small scotomata had disappeared; he had lost the consciousness of a cloud, and the optic disk had resumed its normal appearance. He had made a complete recovery, and has regained much better general health.

There probably is no doubt that the optic neuritis was due to the apical dental sepsis, and that the patient's resistance was impaired by absorption from the septic tonsil and from the pyorrhea.

At a time when there is a tendency to a reaction from the wholesale removal of teeth on *x*-ray findings it is well to remember that where an important organ such as the eye is in jeopardy, and search for other causes has failed, a suspicious tooth should be sacrificed without hesitation.

The author wishes to emphasize the great value of the Elliot scotometer, which is, of course, only a very quick and convenient means of applying Bjerrum's test. The enlargement of the blind spot and the two small scotomata would be entirely missed by the ordinary perimeter. A 2-millimeter white object is used at a meter distance, and the central field up to 25 degrees is, as it were, magnified. The slight haziness at the nasal edge of the disk was not obviously pathological; and, with normal vision and no central scotoma, had he not found confirmatory evidence of its significance by means of the scotometer, he might on his first visit have missed it altogether. A second opportunity, when the diagnosis was obvious, might not have been afforded him, to the detriment of the patient and the discredit of our specialty.

Glaucoma

Chronic Glaucoma. Because of the insidious nature of the early stages of many cases of glaucoma, and because of the importance of early recognition of the condition at a stage when proper treatment may be of some help in checking its advance, W. H. Wilder[3] directs attention to the important diagnostic signs in the non-congestive form of the disease; the diagnosis of this form presenting a much more difficult problem than in the congestive or acute form. In the non-congestive

(3) Illinois M. J., January, 1929.

type the intra-ocular pressure is not at all times measurably increased, so that there are cases that frequently puzzle us in diagnosis and raise questions as to treatment. Frequently they present little or no impairment of central vision; the onset of increased intra-ocular pressure has been insidious and its progress slow. The first intimation of anything wrong may be the discovery, in the routine examination, of a cupped disk, and then further examination elicits the glaucomatous condition. Or the patient may complain of dull pain, again of neuralgic pains in and around the eyes at times, blurring of the vision when reading as if his glasses do not fit. Such symptoms may indicate disturbances of accommodation from congestion of the ciliary body, or disturbance in the refractive power of the lens from increased pressure. It may occur in myopes as well as hyperopes.

Probably in these cases of so-called simple glaucoma the increase in tension is not constant, but intermittent. Before the days of more accurate testing of tension with the tonometer, there was question as to whether many of these simple glaucomas manifested any increased tension, it being too slight to be noted by digital examination, but careful tests with the tonometer reveal that, at times, increased tension exists.

It is in such cases that we must arrive at the diagnosis by the study of visual fields, the central vision, the appearance of the optic disk and a record of the tension as taken with the tonometer at various times.

The fields for white and colors should be taken not once but frequently to record the progress of the case. They should be taken by the same observer each time, and as far as possible under the same conditions as to light, environment, background, etc., for there is no examination that admits of a greater chance for error on the part of both patient and observer than a perimetric examination of the visual fields.

We are all familiar with the various irregularities

and contractions of the fields that are present in simple glaucoma, but certain features stand out prominently enough to make definite characteristics. The contraction of the field is usually, though not invariably, found on the nasal side. It may be more marked above or below, depending upon the pressure upon the optic nerve.

Bjerrum pointed out that in early glaucoma there develops a scotoma beginning at the blind spot and sweeping around the fixation point either above or below producing an arcuate, or in extreme cases, an annular scotoma. Sidel has described similar scotomas, winglike extensions of the blind spot, sickle shaped with their concavity toward the fixation point. To chart these defects small objects of 1 mm. or 2 mm. must be used either on a Bjerrum screen or with the excellent instrument devised by L. C. Peter, the campimeter. Lloyds' stereocampimeter is even more useful in cases that have binocular single vision. These signs furnish valuable testimony in the diagnosis of early glaucoma.

Sooner or later if the glaucoma progresses the blind part of the field is found to be in contact with the blind spot of Mariotte as first pointed out by Bjerrum.

With the continuance of the intra-ocular pressure the contraction of the visual fields proceeds until final blindness is reached. The color fields usually contract concentrically with the field for white, but atrophic processes in the optic nerve may alter the rule. In simple glaucoma the pressure may not be great but it may be continuous. In some cases it may not be continuous, but may be intermittent.

One should be able to determine with a fair degree of accuracy the hardness of the eyeball from its compressibility and so be able to say whether the intra-ocular pressure is normal or abnormal. Formerly, ophthalmologists relied upon digital palpation for this purpose, but the modern tonometer enables us to get more accurate results than can be obtained with the fingers.

Every ophthalmologist should have a reliable tonometer and should be skilled in its use; it is as important in his work as is the blood pressure apparatus in the work of the general physician. Not that he should neglect acquiring that skill in palpation that will tell him at once that the tension is normal or distinctly abnormal, which he should constantly use, but that he may have a more accurate measure of the tension than the fingers alone can give. Furthermore, a record of observations can be made so that comparisons can be made from time to time as to the condition of the pressure which could not be so well done with digital examinations.

With any form of tonometer errors may arise from inaccuracy of technic, and with any of them, however carefully calibrated they may be, there will be variations in results arising from such conditions as rigid or flaccid cornea, slight keratoconus, high astigmatism regular or irregular, corneal scars, etc. It may or may not give us an accurate reading of the intra-ocular pressure in terms of millimeters of mercury, but it will from day to day or week to week, if properly used, give us on the same patient the relation of impressibility of the eye to intra-ocular pressure.

The instrument should be frequently tested on the artificial metal cornea to make sure that the indicator arm registers accurately at zero on the scale. The instrument must be kept in perfect condition so that the plunger glides easily.

Numerous observations seem to show that the normal limits of pressure seem to be between 15 mm. and 26 mm. on the Schiotz scale, but there may be individual cases where 28 mm. or even 30 mm. is normal.

The author describes the various methods of treatment for this condition, and those which have produced the best results in his own experience.

What the Refractionist Should Know About Glaucoma. Otis Wolfe[4] issues a timely warning to physi-

(4) Eye, Ear, Nose & Throat Monthly, April, 1929.

cians undertaking to do refraction work. If he is not capable of making the most exacting analysis of suspicious cases, it is absolutely imperative that he should advise the patients to consult an ophthalmologist who is. In this manner, he will be a prime factor in the great work of conservation of vision.

It is absolutely necessary that the physician who refracts be familiar with the signs and symptoms of glaucoma. This is especially true of non-inflammatory glaucoma. Even the specialist must be ever on his guard that he does not overlook the incipient cases. He should encounter no difficulty if his examinations are thorough. He should even find and remedy many preglaucomatous conditions. This is a day of preventive medicine.

The patient usually considers his asthenopic symptoms as caused by a need of glasses or a change from the ones he is wearing. It is very important that the accompanying error of refraction be corrected by adequate lenses. The refractionist must accept the responsibility of separating the symptoms that are due to refractive errors and those due to non-inflammatory glaucoma. He most frequently sees the patient before considerable loss of vision has occurred. The patient presumes the refractionist is competent to advise him about his eyes and to remedy any visual defect. The responsibility, therefore, rests squarely on the shoulders of the refractionist and cannot be shifted. He must so advise his patients that vision will be conserved.

The chronic or non-congestive type of glaucoma, sometimes spoken of as glaucoma simplex, is seldom accompanied by pain and inflammation, so that its diagnosis is frequently overlooked until great damage is done. It has been estimated that 30 to 40 per cent of the blindness occurring after middle life is directly or indirectly due to glaucoma—the non-inflammatory type causing the major portion. Gradual loss of vision is the chief symptom and frequently the only one. The refraction-

ist is consequently consulted for glasses, and, therefore, he should be thoroughly familiar with the many phases of glaucoma.

Patients with premature presbyopia, subnormal accommodation or a deep physiological cupping may possibly be predisposed to glaucoma. Diminished light sense may be a prodromal symptom, the patient complaining of difficult vision when changing from a light to a dark room.

Cupping of the disk is a cardinal sign of glaucoma, but it often comes late. If the disk shows the slightest depression at the margin or has a greyish appearance, it should be considered suspicious. If it is a physiologic cupping, the disk margin will not be below the level of the surrounding retina. If the disk vessels bend or dip sharply at the margin of the disk, the case should be examined very carefully for other symptoms.

Glaucoma is more frequent in hyperopia, but it should be remembered that it also occurs in myopia. The patient thinks his glasses need changing, particularly those for near work. He frequently goes from one refractionist to another, feeling that his glasses are not correct or have not lasted him as they should. He will tell you "they need changing every few months." He may complain of a slight neuralgia or may present no symptoms whatever, except failing vision. The refractionist may put it down as an axiom that "whenever the patient requires a frequent change of glasses, the corrected vision gradually failing, a fundus that can be plainly viewed, noncongestive glaucoma should be suspected." A slow or dilated pupil along with a shallow anterior chamber may also be noted. Inspecting the pupil by magnification and oblique illumination will greatly facilitate this.

In advanced cases the eyeball will be found firm and hard to finger palpation and the cupped disk will be seen. The diagnosis is then easy, but irreparable damage has been done. We must learn to diagnose the con-

dition in the early state, so that preventive measures can be instituted before a considerable amount of vision is lost. We have two positive means of revealing this information. First, the testing of tension by the tonometer. Second, study of the visual fields, especially the color field.

[There are many physicians, located miles from the nearest city that has a specialist, who understand the elementary principles of refraction, and do this work, almost of necessity. To this class of refractionists the above article is especially commended. The question of treatment is omitted from this abstract, because as soon as the physician has made a diagnosis of glaucoma, he will demand that the patient consult an ophthalmologist.—Ed.]

Writing on the same line of thought, George Derby[5] mentions one other phase of the disease that tends to obscure the diagnosis. The insidious nature of chronic glaucoma is due to the fact that central vision is retained till the final stages of the disease. The patient retains visual acuity over a small area and is able to read, and either does not notice or does not pay much attention to his failing peripheral vision.

Glaucosan. E. C. Ellett[6] reports the results he has obtained from the use of glaucosan in the treatment of glaucoma and other conditions. Our knowledge of this preparation dates from 1922, when Carl Hamburger advocated the use of adrenalin or suprarenin in the treatment of simple glaucoma, later developing the drug called glaucosan. This is a combination of dextrorotatory suprarenin, or ordinary suprarenin, and methylaminoaceto-pyrocatechol, a polariscopically neutral by-product in the synthetic manufacture of suprarenin. This was intended for subconjunctival injection.

Continuing his researches, he developed a synthetic levorotatory tartaric acid alkaloid, derived from the

(5) New England J. Med., Nov. 1, 1928.
(6) Am. J. Ophth., May, 1929.

suprarenal capsule, which he called "Linksglaukosan" (levoglaucosan). This, used in 2 per cent strength and combined with methylaminoaceto-pyrocatechol in the same strength, proved to be active enough to use by instillation only. It causes a dilatation of the pupil and a decrease in intra-ocular tension. This is the preparation known as "glaucosan." It comes in sterile glass ampoules in 2 per cent solution and in the combination referred to, ready for use.

Hamburger also described an amin derivative of ergot called amin-glaucosan (imidazolylethylamin hydrochlorid) which is supposed to be a powerful miotic, and when used in acute glaucoma is said to cause contraction of the pupil and a decrease in tension.

The method of instillation of levoglaucosan is simple. The eye is anesthetized with holocain or butyn, and then, with the patient in a recumbent position, two drops of the solution as furnished in the ampoules are instilled in the cul-de-sac. While the lids are held open, the patient is directed to rotate his globe in the four cardinal directions, which allows the drug to come into free contact with the globe. The drops are repeated from three to five times at intervals of fifteen minutes. In a few moments after the first drop, the eye should become porcelain white, the lid aperture widen, and the pupil dilate quite regularly, while a zone of ischemia usually develops on the lids, cheek, and temple. Practically always there is a distinct drop in tension.

Case histories are given by Ellett to illustrate the effect of levoglaucosan (Linksglaukosan) in simple glaucoma; of amin-glaucosan in acute glaucoma; and of levoglaucosan in acute iritis with posterior synechiæ, and in iris adhesions accompanying injuries. In five cases of simple glaucoma levoglaucosan lowered the tension transitorily, five cases were unaffected, one was permanently improved, but in no case was the tension permanently lowered by the use of glaucosan alone.

Amin-glaucosan failed to reduce the tension in six cases of acute glaucoma. Levoglaucosan was valuable in breaking fresh iris adhesions in acute iritis or uveitis, was of no value in separating old iris adhesions, and did not break up adhesions directly associated with injuries.

Treatment of Glaucoma by Adrenalin and Histamin (So-Called "Glaucosans"). The importance of any drug which has a beneficial effect on glaucoma, whether acute or chronic, can hardly be over-estimated; consequently it is of great interest to read the reports of W. S. Duke-Elder and F. W. Law[7], of the claims made by several authors—notably Hamburger—on the beneficial effect of the so-called "glaucosan" group of substances in bringing about a diminution of the intra-ocular tension. This name, introduced by Hamburger, is unfortunate, since the two substances upon which the "glaucosans" are based—adrenalin and histamin—are widely different in both their chemical constitution and their physiological properties.

Adrenalin, the product of the activity of the chromaffine cells of the medulla of the suprarenal glands, is a methyl-amino-pyrocatechol. Since it contains an asymmetrical carbon atom there are two possible isomeric forms: the levo-rotatory form occurs naturally, while the dextro-isomer can be made synthetically. The levo-form is extremely active, being detectable in a dilution of one part in 250 million of saline, but the synthetic dextro-isomer is considerably weaker, so that the racemic mixture has only about half the activity of the natural product. Although the rationale of the action of this substance on the blood vessels has been the object of an immense amount of research since the original investigations of Oliver and Schafer in 1895, it cannot yet be said to be completely elucidated. The generally accepted interpretation of its activity at the present time is as follows:

(7) Brit. M. J., March 30, 1929.

1. In very small doses it dilates the capillaries, probably by direct action upon the capillary walls, thus causing a small drop in general blood pressure, and an increase in the permeability of the capillary walls.

2. In larger doses, while the first action may to some extent persist, it is completely masked by an active constriction of all the arteries and arterioles which are supplied by the sympathetic nervous system; this is the generally accepted "classical" view of the action of adrenalin, and it brings about a great increase of the blood pressure.

3. In relatively concentrated doses applied locally, adrenalin causes a direct contraction of the terminal arterioles, the capillaries, and the small venules, a reaction which can be observed directly with the microscope by injecting a minute quantity into the skin. Here the drug acts directly on the walls of the vessels, the reaction being equally vivid after denervation.

There is a considerable amount of evidence that histamin, or histamin-like substances, are produced by all organs of the body. Like adrenalin it is an extremely reactive substance, an injection of one-hundred-millionth part of a milligram producing a well-marked effect. Its chemical name is imin-azolyl-ethyl-amin.

The general action of histamin is to constrict plain muscle; this includes the musculature of the arterioles, of the larger veins, and also, incidentally, of the pupil. This is accompanied by a dilatation of the capillaries, caused by a direct action on the walls of the vessels comparable to the effect of small doses of adrenalin. The first of these effects tends to produce a rise of blood pressure, and the second produces a profound fall. In such animals as the cat both of these reactions are evident; in dogs, monkeys, and man the constrictor effect on the arterioles is completely masked, but the dilator effect on the capillaries seems to be universal throughout the mammalia. So far as the blood vessels are con-

cerned, therefore, the generally accepted action of histamin in man appears to be:

1. A dilatation of the capillaries by local direct action upon their walls.

2. A widespread dilatation of the arterioles by a local reflex nervous mechanism.

3. An increased permeability of the capillary walls leading to widespread edema, a result of the direct action of the drug on the capillary walls.

It would seem, therefore, that in their general action the two substances, adrenalin and histamin, are antagonistic; and there is a large amount of evidence that they play such a reciprocal part throughout the body generally, histamin, or histamin-like substances, tending to dilate the capillaries, this influence being kept in check by the constrictor effect of adrenalin (and pituitrin).

The action of adrenalin on the intra-ocular pressure was first adequately studied by Wessely (1900), Parsons (1903), and Henderson and Starling (1904), and later work has merely served to substantiate their conclusions. There are two main opposing influences at work: the local constriction of the vessels tends to bring about a lowering of the intra-ocular pressure, while the general rise of blood pressure tends to bring about a rise. In experimental animals either of these may be evident, or they both may occur, the second following the first; in man there is usually a period of hypotension which is followed by a slight rise. It would appear that in cases of simple glaucoma this reaction is retained, the fall of tension being more evident, but that in the acute or absolute forms of the disease the opposite condition may develop. When injected into the blood stream adrenalin dilates the pupil widely, an action which is evident on subconjunctival injection, but which is retained only with difficulty on instillation into the conjunctival sac except in specially sensitive persons.

After the work of the early experimenters several clinicians used adrenalin clinically for the relief of ten-

sion in glaucoma, with, in general, indeterminate results. It has become evident that while in chronic glaucoma adrenalin may or may not do good, in acute conditions its use is definitely dangerous. Moreover, unpleasant effects have been noted from time to time, for a rapidly increased blood pressure with a pulse running up to 200 a minute involving a considerable amount of collapse is not a thing to be desired in the average type of person who is a glaucomatous subject.

To avoid these unpleasant consequences Hamburger turned to the less active dextro-isomer of adrenalin, and, combining it with one of the precursors in its preparation (methyl-amino-aceto-pyrocatechol), he introduced the combination as "glaucosan." He claimed that this preparation produced a local vasoconstriction without any general reaction, and that it reduced the tension of the eye, usually for several days, and sometimes for several weeks. The action was, however, so weak that a subconjunctival injection was required, and therefore, in order that the remedy could be made sufficiently powerful to be used as drops, he combined the methyl-amino-aceto-pyrocatechol with synthetic levo-adrenalin, and produced "levo-glaucosan." This is said to lower the tension for some days and to dilate the pupil maximally.

Hamburger considers that the primary cause of glaucoma is a "relaxation of the vaso-constricting mechanism, thereby causing a repletion of the eye with blood;" adrenalin and its derivatives lower the tension immediately by causing a vasoconstriction, and he somewhat paradoxically explains the continued hypotensive action of the drug by the supposition that the reactive hyperemia which follows the anemia will lead to "softening of the eye." It must be admitted that this explanation is as unconvincing as it is difficult to follow. However that may be, while good results were claimed in chronic glaucoma, the preparation appeared to be unsatisfactory in acute cases of the disease (probably

on account of the mydriasis). Hamburger therefore turned to histamin (which he called "amino-glaucosan"), a substance which, as we have seen, in addition to producing a capillary dilatation, brings about a very marked miosis by its action on plain muscle. Owing to the severity of its reaction and the short duration of its effects its use in chronic cases seemed undesirable; but in acute cases which are not absolute in nature Hamburger claims good, although not invariably successful, results.

Fifteen cases have been treated by these two observers; the two drugs as recommended by Hamburger—levo-glaucosan in cases of chronic glaucoma, and amino-glaucosan for acute glaucoma; and they were administered exactly as recommended by him.

Levo-glaucosan (L.G.) was given after the instillation of 1 per cent holocain; two drops were instilled into the conjunctival sac, giving ample time for absorption, and the injections were repeated three to five times at intervals of fifteen minutes. After instillation there was a considerable reaction, and always a greater or less degree of pain. The eye became white, the pupil dilated by a varying amount, and anemic patches were sometimes visible on the skin of the lids and the cheek. Amino-glaucosan (A.G.) was given also after holocain, one drop of the 2, 7, or 10 per cent solution being instilled; the great hyperemia, sometimes with chemosis, was invariably followed by severe pain. On some occasions where it seemed to be without effect it was repeated.

From the experience of these fifteen cases, the following suggestions are made:

1. So far as can be seen neither of the two drugs has any prolonged effect in lowering the intra-ocular tension. Their action would seem to be temporary and adjuvant to other treatment, postponing, perhaps, but not without any special reason replacing, operation. The action of the drugs is neither uniform nor dramatic.

2. In chronic primary glaucoma levo-glaucosan cannot be depended upon to lower the tension; it does so in some cases, but completely fails in others. It appears, however, that in conjunction with eserin a good effect can be produced in a case where eserin alone has remained ineffective.

3. The dilatation of the pupil caused by levo-glaucosan may be valuable from a diagnostic point of view, since, so far as our experience goes, the dilatation is not accompanied by raised tension.

4. In secondary glaucoma levo-glaucosan will succeed in rupturing synechiae which with other mydriatics remain unaffected. In cases of iritis with raised tension it may be effective as a preliminary measure when hesitation is felt in giving atropin at once, or where atropin has failed to relieve the condition. Owing to the accompanying anemia, however, its repeated use would appear inadvisable in such cases.

5. Amino-glaucosan is an extremely potent miotic. It cannot be depended upon to contract the pupil and lower the tension in every case of acute glaucoma, but it would appear on occasion to be a very useful adjunct to eserin. In cases where the pupil remains dilated and the tension raised after the administration of amino-glaucosan, this preliminary treatment has undoubtedly made eserin effective subsequently in bringing about a contraction of the pupil and a lowering of the tension. No case has been met with where the drug has caused a rise of tension (as has been reported), but in several cases, although given every legitimate opportunity, it has been without any hypotensive effect.

6. Both drugs are accompanied by a severe reaction and pain, in some cases moderate, in others involving considerable distress. The occurrence of a hypopyon ulcer without other obvious cause after the use of amino-glaucosan suggests that the severity of the reaction on the superficial parts of the eye is not without danger

to the cornea, especially in cases where infection is known to be present.

Hypertonic Salt Solution for Glaucoma. In recent years much stress has been laid on osmosis occurring between the capillaries and the aqueous humor as a factor in the maintenance of normal intra-ocular pressure and in the pathogenesis of glaucoma. In 1926 W. S. Duke-Elder published experiments proving that intra-ocular tension can be temporarily lowered by the slow intravenous injection of a hypertonic solution of salt into the general circulation, and advocated this procedure in certain cases of glaucoma as a temporary measure to reduce tension prior to operation. This method had already been tried with success in a few cases, and R. E. Wright[8] has since then reported his observations. A series of 20 cases of glaucoma patients were taken without selection, so far as the variety of glaucoma was concerned. Their body-weight, blood pressure, intra-ocular tension, and a sample of blood were taken before saline injection, and again at intervals afterwards. The hypertonic solution was injected slowly into a vein of the arm—30 gr. per 100 c.c. of sodium chlorid, the dose given being in most cases 20 c.c., which worked out to an average of 0.134 gr. of sodium chlorid per kilogram of body-weight. Within 15 minutes of giving the injection the average fall of intra-ocular tension was from 46.7 to 34.2, and this fall was maintained with slight variations for 24 hours. The writer concludes that therapeutically the injection of strong sodium chlorid solution is a valuable means of lowering the intra-ocular tension, effective in the great majority of cases, and especially valuable as a pre-operative procedure; but cautiously adds that it remains to be shown whether the fall in intra-ocular tension is more closely connected with the osmotic pressure or with other changes in the constitution of the blood. The main danger, according to Duke-Elder, is a

(8) Lancet, September, 1928.

sudden fall in the blood pressure which may occur during the injection, but this is obviated if the injection is made slowly and regularly, with a patient in the recumbent position.

The Relative Value of Glaucoma Operations. It is within the range of possibilities in the future that we may find some non-surgical method or methods of controlling intra-ocular tension in glaucoma. This is a prediction of twenty years' standing. For the present and the immediate future, however, surgery will continue to play a dominant rôle in the preservation of the fields and the control of tension in a large number of cases.

The operative procedures practiced for the relief of glaucoma are as numerous as the methods of extracting cataract. Some have merit and are based on sound surgical principles. Others are manifestly lacking in efficiency, largely because the surgical principles involved are basically unsound. The multiplicity of methods may be interpreted as indicative of unsatisfactory results, and an effort to develop more effective procedures, or it may be interpreted as a consciousness of the need for varied technic to meet special indications. Both factors are definitely active in the development of new types of operations for the relief of glaucoma. Operators of large experience have felt that, although the broad classical iridectomy has proven its efficiency in some cases, the percentage of failures warranted further study in the development of newer and better types of operations, for example, the Lagrange anterior sclerectomy, the Elliot sclerocorneal trephining operation, iridotasis, cyclodialysis, and others based on the same surgical principles. These additions have resulted in an increase in the percentage of satisfactory results, and in the future the proper appraisement of the value of each form of procedure and the special adaptability of each to definite types and stages of the disease, prom-

ise an even higher percentage of successes than we have been able to obtain in the past.

A point which will bear stressing preliminary to the choosing of an operation is the following: Although each individual operator should develop and perfect his operation of choice, which will yield the best results in his hands, he should be prepared to perform well the type of operation which experience teaches is indicated in a given case. The operation of choice in the first place should be one which, in the opinion of those of large experience, yields the best results. In the second place, this choice must be influenced by the individual operator's ability to acquire the technic required for its correct performance. For example, although sclerocorneal trephining, according to statistics drawn from the literature, is of greater value than the classical iridectomy, a well performed iridectomy may offer better average results than a poorly executed trephining. It obviously is the duty of an individual operator, who has acquired a good technic in iridectomies, to give his patients the benefit of his skill in selecting this operation as his by choice, until he has acquired the refinements of trephining on pigs' eyes and on eyes that are sightless or nearly so. It is equally obvious, however, that his patient should be given the benefit of the best type of operation indicated in his case, and the operator should strive to perfect his technic in the newer types of operations, if it can be shown that they offer a higher percentage of successes than that of iridectomy.

Luther C. Peter[9] gives statistics of other operators as to their percentage of results in these different operations. His own results he summarizes briefly as follows: he gives sclerocorneal trephining the premier place in the operations for glaucoma. It is applicable to a large number of patients and is the operation of choice in the greatest number of cases. Its results are most enduring.

Iridectomy is of value in acute glaucoma, and in im-

(9) Pacific Coast Oto-Ophth. Soc., 1928.

mature cataract when complicated by secondary glaucoma.

Cyclodialysis has a limited, but definite, application. It fills a gap in a fair number of cases in which other methods are apt to fail. They are the cases of glaucoma secondary to a swelling lens and after lens extraction, whether the glaucoma is primary or secondary. It also is of limited value in advanced cases when vision and the visual fields are reduced to a minimum. It should also be tried when the conjunctiva is too thin to admit of a good flap. It is not a routine type of operation, but one for selected cases and not too reassuring as to results.

Anterior sclerectomy is of much value, but is attended by dangers not encountered in trephining. If practiced, it should be upon eyes of moderate tension.

Iris inclusion should be held *sub judice*. In the hands of some, it is highly regarded. It will require a more general approval before it can rank with other procedures in efficiency.

Posterior sclerotomy is to be recommended as a measure of much value in temporarily preserving vision and paving the way for an operation of more permanent results.

Paracentesis of the anterior chamber, like posterior sclerotomy, is a preliminary measure of great value. Its indications differ from the latter, but in efficiency in accomplishing results, the two measures take equal rank.

Ocular Tuberculosis

Difficulties in Diagnosis of Tuberculosis of the Eye. From a rather wide experience in ocular tuberculosis, W. C. Finnoff[1] says that it is often difficult to recognize tuberculosis when it occurs in the eye. Its symptoms frequently simulate other diseases and are not always characteristic. If this were not the case, the statistics

(1) Illinois M. J., March, 1929.

of European and American Clinics would not vary so greatly. In this country only a small percentage of the cases of chronic anterior uveitis are classified as tuberculous, while in Austria and Germany at least 50 per cent are said to be due to it. One who has visited the hospitals of Vienna could not help being impressed with the large number of cases that are diagnosed as tuberculosis.

Ophthalmologists on this side of the Atlantic are inclined to group only those cases that have definite tubercle formation as being due to tuberculosis and hesitate to place diffuse chronic anterior uveitis under that heading. The microscopic examination of enucleated eyes with diffuse anterior uveitis has not helped us in solving the question because the iris and ciliary body may only show the pathological picture of a chronic uveal inflammation. In most cases there is no caseation and tubercle bacilli cannot be demonstrated in the tissues. Epithelioid and giant cells are found in other diseases and in themselves are not characteristic. If it were practical, the transplantation of uveal tissue from an affected eye into the peritoneal cavity or anterior chamber of laboratory animals would solve the problem in the average case. For these reasons it is difficult to diagnose with certainty diffuse tuberculous iritis.

The presence of minute, gray, avascular nodules at the pupillary border in cases of diffuse iritis is said by Koeppe to be characteristic of either tuberculosis, syphilis or sympathetic ophthalmia. He unhesitatingly classifies cases as tuberculous with nodules of this type, when syphilis and sympathetic ophthalmia can be excluded. However, Finnoff is not so certain that an unqualified diagnosis should be made on this symptom alone.

In the past we have been inclined to look upon tuberculin as a reliable diagnostic agent in tuberculosis of the eye and to place much faith in its therapeutic efficiency. It undoubtedly is of great value in many cases but it is

not a specific and further research may show that it is of no more value than other forms of non-specific foreign protein. Confidence in tuberculin as a diagnostic agent has been shaken because of its failure to produce a focal reaction in eyes that were enucleated and proven by microscopic examination of sections to be due to tuberculosis. Focal reactions occur in tuberculosis after the injection of other foreign proteins.

In a study of the reaction of tuberculin and other foreign proteins in the eyes of rabbits that had known tuberculosis of the uveal tract, the majority reacted focally to large doses of tuberculin when administered subcutaneously. Other proteins produced similar reactions. In one instance a severe reaction with a large hemorrhage into the anterior chamber occurred after the intravenous injection of typhoid vaccine. Further research is in progress to determine whether this phenomenon occurs frequently.

It is often very difficult to classify lesions of the cornea. The pathology of chronic interstitial keratitis is quite similar in a number of conditions and the clinical picture consequently is much the same. Tuberculosis is rarely primary in the cornea. When it occurs it is usually associated with tuberculosis of the uveal tract and the sclera is also often invaded. When yellowish caseated areas are present at the base of the iris and the cornea becomes involved tuberculosis should be suspected. In iris tubercles the nodule often touches the cornea and extends into it.

The clinical appearance of syphilitic interstitial keratitis, on the other hand, is identical with diffuse tuberculous keratitis and in the absence of a positive Wassermann reaction and other signs of congenital syphilis it may be impossible to make a differential diagnosis.

Scleritis and episcleritis are very frequently due to tuberculosis. Verhoeff said: "Now if there is any one thing of which I am sure, it is that ordinary scleritis

and keratitis, that is to say, anterior nodular scleritis, are always due to tuberculosis."

Because of the position of the ciliary body inflammatory foci in it cannot be seen, and the cause of inflammation in this structure is always obscure. Disease in this portion of the eye if protracted and relatively free from pain and accompanied with periods of improvement and remission, should suggest tuberculosis. Large whitish mutton fat deposits on the posterior surface of the cornea are also characteristic and often nodules occur in the iris. The cornea and sclera may become invaded also. Many cases of tuberculosis of the ciliary body are overlooked. This author has seen it several times in microscopic sections of eyes in which its presence had not been suspected before the enucleation. This conforms with the experience of Fleischer who in 1914 found evidence of tuberculosis in the anterior segment of the eye in a case with tuberculosis of the retinal vessels. His view was that tuberculosis of the retinal vessels was preceded by tuberculosis of the ciliary body. Verhoeff's view is that the origin of chronic ocular tuberculosis in general is due to the passage of the tubercle bacillus from the ciliary body into the aqueous and from there it is carried to other parts of the eye when it lodges and produces secondary foci.

Miliary tuberculosis of the choroid is easily diagnosed. The isolated yellowish nodules are characteristic and the history of generalized or meningeal tuberculosis give confirmatory evidence. It is seen so frequently as a terminal stage that few cases survive for a long period of time. The etiology of disseminated choroiditis or chorio retinitis, on the other hand, is extremely difficult to determine. The tuberculous form is usually more extensive than other types and there is a tendency for one lesion to blend imperceptibly with another. The edges of the infiltration are irregular, the retina elevated and edematous. The illustration of diffuse retinal tuberculosis in Adam's atlas is a good example of the oph-

thalmoscopic appearance of the active stage of the disease. The end result is widespread pigmentation and atrophy of the retina and choroid.

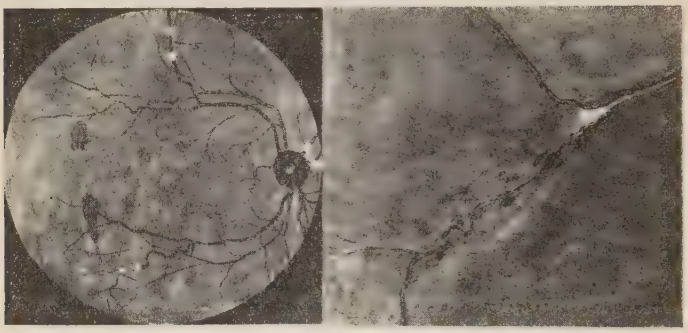


Fig. 37—Left: Tuberculosis of retinal vessels. Early appearance.
Fig. 38—Right: Late change showing perivascular exudate and at junction of veins and constriction of walls. Note the hemorrhages into the retina.

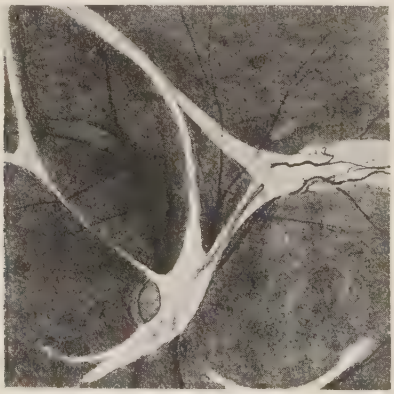


Fig. 39—Terminal stage of tuberculosis of the retinal vessels—retinitis proliferans and localized detachment of the retina. Compare Figures 37 and 38.

The solitary tubercle frequently is confused with tumor or gumma. As a matter of fact it may be impossible to make a differential diagnosis in the early stage. (Figs. 37, 38 and 39).

It is exceedingly difficult to diagnose retinal tuberculosis. It occurs in several forms and may closely simulate other types of retinitis. It frequently is associated with disease in the choroid. In a large series of experiments on rabbits it only occurred independently of the choroid in two cases.

Retinal tuberculosis is seen most frequently in one or two forms, i. e., retinal perivasculitis or isolated tubercles in the retina itself. Occasionally mixed forms occur.

The isolated spots that involve the macula may approach the appearance of the spots of renal retinitis. They are usually less brilliant and their edges fade gradually into the surrounding fundus. They may be difficult to differentiate from the exudates of renal retinitis, diabetes and vascular sclerosis.

Retinal periphlebitis is easily diagnosed and in most cases is due to tuberculosis. When associated with perivascular exudates at the junction of venous tributaries it is probably a tuberculous process. It begins in the periphery of the fundus and gradually travels backward toward the optic nerve. Hemorrhages occur early into the retina and vitreous and frequently obscure the true nature of the fundus disease. In recurrent hemorrhages into the retina and vitreous tuberculosis is often the cause. However, Finnoff feels convinced that it is not always the etiology. Several years ago he analyzed a series of cases and reviewed the literature on this subject and came to the following conclusions:

1. Recurrent hemorrhages into retina and vitreous in young persons is probably not a specific disease.

2. Tuberculosis of the retinal vessels, especially the veins, is one of the common etiologic factors. (a) To prove that the cause is tuberculosis, a focal reaction should be obtained. (b) When due to tuberculosis, improvement follows the administration of tuberculin and hygienic treatment.

3. Syphilis is an occasional cause.

4. Focal infection is a possible cause.

5. Hemophilia is not a cause, but might be a contributing factor.

6. The hemorrhages are the result of a localized pathologic weakening of the blood vessels, and increased blood pressure or exercise are only exciting causes.

7. The veins are usually attacked.

8. In some cases there is involvement of the retina early in the disease.

9. In most cases the earlier changes occur in the periphery of the eye, and if patients were examined in the early stages of the disease, we would learn more about the pathology.

10. Retinitis proliferans occurs in most cases.

11. The disease is primarily in the retina, and the partial or complete detachment of the retina is due to traction from scar tissue and not to subretinal hemorrhages from the choroidal vessels, as has been suggested.

Jackson states: "The clinical picture that it seems important to fix in relation to retinal tuberculosis includes these features; vitreous opacities, recurrent hemorrhages, enlargement of the retinal veins, local lesions described (small white spots in the macula) associated with enlargement of the retinal veins, white spots in the macula in some cases, optic neuritis and retinitis proliferans as a terminal condition."

Tuberculosis of the optic nerve is rare and should offer no difficulty in diagnosis.

When the disease occurs in the conjunctiva its diagnosis is usually easy. Microscopic examination of the tissue and animal inoculations can be made without difficulty and there should be no reason for confusing it with other processes.

The lacrimal sac is a frequent source of tuberculosis. Stock found it in a large percentage of his cases. It usually is not diagnosed until after the sac is extirpated and examined under the microscope.

Periosteitis of the orbit may be due to a number of

causes and it is usually difficult to diagnose. Biopsy and animal inoculations of the diseased tissues should be resorted to in all cases.

From the knowledge gained from his experience in ocular tuberculosis, the author comes to the following conclusions:

1. All cases of tuberculosis of the eye present difficulties in diagnosis.

2. Tuberculosis of the eye may closely simulate other chronic eye diseases and in some cases the only positive means of determining the cause is microscopic examination or animal inoculation.

3. Tuberculin as a diagnostic agent is unreliable. It may aid in some cases.

4. Focal reactions in tuberculous lesions are not specific but may occur after the injection of foreign proteins other than tuberculin.

5. A diagnosis must usually be based on the history, clinical appearance, and course of the disease. If a focal reaction occurs after the injection of diagnostic doses of tuberculin it is merely additional evidence.

The differential diagnosis of tubercle in the eye, according to Sir Arnold Lawson[2], might be said to rest on one or more of the following considerations: The presence of active tuberculosis elsewhere. In the eye tuberculosis was essentially a surgical rather than a medical condition. Ocular tuberculosis, as an accompaniment of phthisis, was very uncommon. Up to, and even after puberty, bovine, as opposed to human, tuberculosis was very common. Bovine tubercle needed a bovine test, as a negation of human tuberculosis did not exclude the bovine form. The possibility of mixed infection should never be forgotten; there was no reason against active tubercle coexisting with active mixed infection. In ocular tubercle there was an absence of subjective symptoms comparatively with objective signs. These cases were insidious in onset, destructive in char-

(2) Lancet, April 20, 1929.

acter, slowly progressive, and intractable; there was a notable absence of severe pain. He opposed the use of Calmette's local conjunctival test as being too dangerous. Tuberculous affections of the eye might be either extra-ocular or intra-ocular, the first of these being so-called primary or secondary. He doubted, however, whether tubercle, even of the conjunctiva, could ever be primary; it was certainly difficult to infect the conjunctiva unless a local abrasion was present. Intra-ocular tubercle was always a secondary infection; it might occur in any part of the uveal tract.

The most common tuberculous inflammation of the eye was irido-cyclitis. Perhaps choroidal tubercle could not be diagnosed clinically at first sight. Tuberculous masses sometimes reached a great size without causing much trouble. They might disappear under the use of tuberculin. Treatment of ocular tuberculosis must be considered from the general and the local points of view, the former especially in the case of children with phlyctenular disease. In a large number of these benefit could not be expected until superabundant adenoids and enlarged tonsils had been removed. Of a series of 42 cases treated with tuberculin only 10 per cent showed no improvement; in 45 per cent healing followed its use. As, however, it might be a dangerous remedy, it should not be used unless it was quite clear that the case was suitable. Probably the value of bovine tuberculin was not yet fully appreciated.

Much good had followed phototherapy for these cases, and he was able to endorse Duke-Elder's findings in this respect in the cases of children with phlyctenular disease. Sir Arnold had not found it of equal value for adults. This treatment should not be regarded as a substitute for, but rather as a supplement to, other methods. The question of the value of local ultraviolet rays was still sub judice.

Duke-Elder regards phototherapy as merely an adjunct to ordinary treatment. It was extremely good in

phlyctenular disease and other tuberculous diseases of the eye. In 33 cases at Moorfields in which the treatment was employed, the average period of treatment before phototherapy was adopted was two and a half years (75 per cent had tuberculin injections also). In the period after the introduction of phototherapy 85 per cent had a quiet eye after an average of five months' treatment; 6 per cent were very much improved. In 9 per cent the disease was still active at the end of that time, though there were hopes of much improvement.

Nasal Infections of the Eye

Eye Disorders of Nasal Origin. The rôle played by nasal infections in diseases of the eye has been recognized for some years, but only recently have we realized the important part played by the nose in these cases.

In order to understand more clearly the reason for the connection between the disease of these two structures, F. L. Wahrer[3] outlines the close anatomic relationship which exists here. He states that eye diseases of nasal origin may be generally divided into four groups: diseases of the optic nerve, inflammation involving the soft tissue of the orbit, diseases of the conjunctiva, and the uveal. Of these, the most important is the involvement of the optic nerve.

Holmes states that about 40 per cent of all eye diseases are due to nasal origin. Diseases of the anterior sinuses cause affections of the bulb, while those of the posterior sinuses cause optic neuritis. Pressure is one of the main factors in retrobulbar neuritis of nasal origin. Atrophy in this type of cases can occur in from fifteen to twenty days.

The cure of all eye diseases of nasal origin must primarily depend upon the eradication of the nasal affection, and the treatment of optic neuritis from this

(3) J. Iowa M. Soc., November, 1928.

source is surgical in practically every case. The ethmoid-sphenoid group must be drained without delay.

In the discussion of this paper A. J. Bedell disagrees somewhat from the author. He is neither convinced that 40 per cent of eye diseases are caused by nasal pathological processes, nor does he feel that we have many optic nerve inflammations as the result of sinus infections.

He thinks it would be unfortunate to give the impression to the public that in the presence of failing vision an immediate nose operation is indicated. Greater attention should be paid to the focal infections, by which we mean isolated collections of pus under pressure. After a competent internist has exhausted all of his resources, he might then consent to have his sinuses opened. It is to be particularly understood that this only refers to an obscure disease where the local examination is negative, the *x*-ray studies fail to disclose pus in the nasal accessory sinuses and where the complete general physical inspection sheds no light on the problem. His plea is for closer cooperation and more intimate contact with those practicing internal medicine. He has seen a patient who in the presence of an immobile pupil, abolished knee jerk, contracted field of vision and a four plus Wassermann, had all of his sinuses, which were normal to all tests, opened without any consideration to the systemic infection.

G. A. May cites the report of Hoffman and Salmonsen on 4,400 cases of sinus disease and out of this number observed that there were but twenty cases of the orbital complications including all forms. It does not seem reasonable that sinus disease or intranasal disease could fully account for the changes we find pathologically in a retra-ocular neuritis with little change in the nerve head.

Emory Hill[4] believes that some rhinologists have gone to extremes in attributing a great many ocular disorders

(4) New York State J. Med., Feb. 1, 1929.

to sinus disease, and that they have confused the signs of intracranial pressure with inflammatory lesions of the optic nerve, to the detriment of the patient who has been subjected to unnecessary surgery and has lost time in getting relief from intracranial disease. On the other hand he thinks that some ophthalmologists have erred in the opposite direction, in denying the resposibility of sinus disease for a small group of optic neuropathies. He states that he has been forcibly impressed by the few cases he has seen, where there can be no reasonable doubt that vision was saved by the prompt clearing up of sinus infection. He quotes a number of observers to show the difference of opinion as to the frequency of this condition.

Francis and Gibson believe that very few cases occur in spite of the paper-thin bone separating the optic nerve from the sphenoid cavity. Von Hippel believes the cases are rare, but regards them as extremely important, since proper treatment is necessary to save vision. Lindenmeyer points out that cases regarded as proven may eventually be explained by a multiple sclerosis, and cites two such cases. Loeb places the frequency as 15 per cent, while Cheval and Coppez find 35 to 40 per cent. Woods and Dunn found 12.7 per cent of optic neuropathies due to sinus disease, and called attention to the acute cases in which the picture is one of retrobulbar neuritis without evidence of inflammation or elevation of the papilla.

Van der Hoeve, whose investigations deserve the utmost respect, described the characteristic sign of central scotoma with enlarged blind spot. The scotoma is at first a relative one for colors. The enlargement of the blind spot appears first. One scotoma may appear alone and invade the region of the other. The exact pathway of infection is not known. He mentions the following possibilities: (1) by direct spread of sinus inflammation; (2) by pressure due to the distention of

the sinus walls, as in mucocele: (3) by irritating influences of toxins causing edema and stasis.

Cutler says that Van der Hoeve's sign is positive when (1) the scotoma for colors is considerably larger than for white; (2) the extent for white and colors is decidedly greater than normal; (3) the size of the scotoma changes in the course of the disease. Van der Hoeve offers the following conclusions: (1) the ophthalmologist has in the eye no sign to distinguish the origin of a retrobulbar neuritis; (2) the rhinologist cannot say with absolute certainty that a person has no sinus infection; (3) opening of the sinus, even if nothing pathologic is found, may be of temporary or permanent good effect on the optic nerve disease.

A series of five cases reported by Hill suggests the importance of the utmost care in studying the sinuses of individuals who have impairment of vision with or without ophthalmoscopic signs in the eye grounds. Inflammatory lesions which are not accounted for by infection located elsewhere in the system, demand this study as part of the search for focal infections. Serious impairment of central vision with normal eye grounds, and not explained by errors of refraction, constitutes an even more serious problem. The central field changes determine the diagnosis here, and the sinuses must not be ignored when the usual causes of toxic amblyopia are excluded.

Several questions arise which cannot yet be answered. The size of the optic foramen may be a factor in the vulnerability of the optic nerve in the presence of very slight infection of the posterior sinuses. The effect of mere ventilation of the sinuses, in the absence of infection, is unsettled. The so-called hyperplastic membrane lining the sinuses, seems to be a cause of optic nerve disturbance. Whatever the rhinologist may eventually decide in these matters, we cannot escape the conclusion that certain eyes are saved by early intervention in cases of obscure or slight sinus disease. The

sequence of events is too prompt and too definite, in too many cases, to be merely coincident.

Traumatic Ophthalmology

Contusion of the Eyelids and Concussion of the Eyeball. Since surgeons and physicians who have had little training in ophthalmology are frequently confronted with patients complaining of various symptoms because of an injury to the eye, the following outline of some of the more common forms of injury, together with the treatment appropriate for each condition, as advised by Conrad Berens and Ray R. Losey[5], will be of special interest.

Contusion of the Eyelids.—Most medical men are familiar with the marked swelling of the eyelids which may result from the slightest injury. This swelling is due to the fact that, in order to facilitate the motion of the eyelid, the skin is very loosely attached to the underlying tissues. The familiar "black eye" is attributable to the extravasated blood from which the hemoglobin has been set free. In the early stages, until the swelling begins to subside, the condition is best treated by cold compresses of a saturated solution of boric acid. In severe cases an ice cap may be used or a small piece of ice wrapped in cloth may be applied. In some instances, even without fracture, the eyelid of the other eye may show discoloration. If the nasal wall of the orbit is fractured, an attempt to blow the nose may force the air into the surrounding tissues. This condition is easily diagnosed by the crepitation noted when the eyelid is palpated. In this type of injury, a pressure bandage should be applied and the patient should refrain from blowing the nose. Further treatment consists in keeping the nasal passages clean and applying cold compresses to the eyelids.

Injuries of the Eyeball.—*Rupture of* the eyeball is

(5) Am. J. Surg., January, 1929.

often caused by a blunt object forcing the eyeball against the bony orbit. Usually the rupture takes place in the angle of the anterior chamber and frequently involves the canal of Schlemm which is concerned with the filtration of the fluids within the eyeball. This canal is in the thin part of the external coat, and is unprotected externally by muscles or other binding tissues. The conjunctiva is so elastic that the lens of the eye may be forced out under it without rupture and appear as a swelling beneath the conjunctiva. If this occurs and the patient is seen early the lens should be removed. Prolapse of part or all of the iris may take place, which would demand surgical intervention. It is usually necessary to excise the prolapsed iris, thereafter inserting a superficial mattress suture in the cornea and episcleral tissue. The conjunctival wound is closed separately. If the vitreous also tends to prolapse, it should be cut away and the lips of the wound brought together by one or two mattress sutures. It is remarkable how much vitreous may be lost with the retention of useful vision. Although many of these eyeballs go on to atrophy or secondary infection, useful vision is retained in some, and consequently, enucleation should not be too hastily performed. To prevent infection the patient should be given an injection of tetanus antitoxin or some non-specific protein to increase non-specific resistance to infection.

If the blow directed against the eyeball is not sufficiently severe to produce rupture of the sclera, many other injuries, commonly not suspected by any except ophthalmologists, may result. *Hemorrhage* frequently follows contusion, subconjunctival hemorrhage being the most usual. This appears as a reddish black discoloration of the conjunctiva which tends to gravitate below the cornea. In the early stages this condition calls for cold compresses; in the later stages hot compresses are used to hasten absorption of the blood.

Hemorrhage may also occur into the anterior chamber,

filling it with blood, and sometimes blood may find its way into the cornea, producing a typical picture caused by absorption of coloring matter from the blood. The presence of blood in the anterior chamber frequently leads to increased intra-ocular tension or secondary glaucoma. This condition sometimes requires a paracentesis of the anterior chamber in order to reduce the tension.

A hemorrhage into the vitreous may take place, or a subhyaloid hemorrhage, that is, between the retina and vitreous, may occur. This type of hemorrhage changes position as the patient moves his head. Hemorrhages into the retina usually appear flame-shaped when superficial or more rounded when deeper; they may be subretinal causing detachment of the retina, or subchorioidal with a resulting detachment of the chorioid. Subchorioidal hemorrhages appear as dark, rounded masses extending into the vitreous, and usually offer a good prognosis. Treatment of these hemorrhages usually consists of rest of both eyes, use of atropin in the affected eye, application of ice or iced compresses in the early stages, and hot compresses in the later stages. Following this, a weak solution of dionin may be used, beginning with ¼ of 1 per cent in the affected eye at night and gradually increasing until a 10 per cent solution is used.

Cornea.—The cornea is often slightly abraded by contusion but is rarely ruptured unless previous disease or injury has thinned it. To detect abrasion of the cornea a 3 per cent. dilution of fluorescein is instilled into the eye; after irrigation the abraded area remains deeply stained. This condition is usually accompanied by great discomfort and sometimes by severe pain, which is best controlled by the use of a 2 per cent holocain solution instilled into the eye. Bichlorid of mercury ointment, 1:5000, is introduced between the eyelids, and a dressing is worn until the area no longer stains. Owing to the

possibility of infection of the denuded area the use of a dressing is most important.

If a corneal rupture with prolapse of the iris has occurred, the iris should be excised, atropin instilled, and bichlorid of mercury ointment, 1:5000, placed between the eyelids. No stitches are used unless there is a large wound the edges of which do not approximate properly, when a superficial suture may be inserted in the cornea with a fine curved needle and No. 1 or finer paraffined silk. The conjunctiva may be dissected up from the limbus and brought down over the wound where it is held by mattress sutures on each side of the cornea, which engage the conjunctival flap and conjunctiva below the cornea.

Milder injuries may give rise to a low-grade traumatic inflammation of the cornea, called traumatic keratitis, in which the stroma of the cornea may be filled with leukocytes. Rupture of Descemet's membrane, recognized as gray streaks under higher magnification, may also occur.

Iris.—The iris frequently shows one or two notches at the pupillary margin due to a partial or complete rupture of its sphincter. This is due to the backward displacement of the iris, and the rapid dilatation which occurs from the injury. If seen early the pupil may be widely dilated but after the inflammatory signs have subsided the use of a ½ per cent solution of pilocarpin and massage of the eyeball will tend to restore it to normal. However, there may remain a slight notching of the pupillary margin. This is seen best under high magnification. Dilatation of the pupil may occur without injury to the sphincter, due to the rapid stretching of the muscle which produces temporary paralysis, or to injury of the third nerve fibers in the region of the ciliary body. The same treatment as for rupture of the sphincter is of benefit in some cases. The iris may be torn away from its attachment to the ciliary body. This is called iridodialysis, and may be only a small tear, or

the iris may be completely separated from its attachment. Little can be done for this injury except to use atropin. If the iris is torn away sufficiently to obstruct the light entering the pupil or if it permits the passage of light through the normal and through the traumatic pupil, a monocular diplopia may be induced, sometimes making it necessary to perform an iridectomy of the prolapsed portion. Iris tissue does not usually tend to reunite, but fortunately this injury most often occurs at the periphery of the iris and causes little or no discomfort. The condition is frequently accompanied by hemorrhage into the anterior chamber.

Ciliary Body.—The iris and part of the ciliary body may become detached by a rupture through the pectinate ligament at the angle of the anterior chamber. This may cause a deepening of the anterior chamber and usually results in some weakening of accommodation. After the early use of cold compresses, atropin and rest, hot compresses and exercises in reading fine print at different distances may help to reestablish accommodation. If the lesion affects the ciliary body, which, according to many authorities, influences the secretion of the intra-ocular fluids, the secretion may be diminished with a rsultant lowering of the intra-ocular tension. Weakness of accommodation may also result from injury to the ciliary body without apparent rupture of the tissues and for this injury accommodative exercises may be of value in the later stages. For the persistence of lowered tension in the eyeball, hot compresses are usually beneficial and in addition the use of increasing strengths of dionin solution. Subconjunctival injections of 5 to 10 minims of normal or hypertonic salt solution once or twice a week after anesthetization of the conjunctiva with 3 drops of 2 per cent holocain and 2 minims of adrenalin, 1:1000, might be of benefit in raising the tension.

Lens.—The most common injury is a dislocation of the lens. This is due to a partial rupture of its sus-

pensory ligament which causes tilting of one edge of the lens resulting in a shallow anterior chamber in this area. Iridodonesis (trembling of the iris when the eye is moved) may result and is due to the fact that the pupillary margin of the iris lacks the support of the lens. If the angle of the anterior chamber is sufficiently blocked by the vitreous and by the iris which is pressed forward, intra-ocular tension may be increased. In severe injuries the iris may be caught behind one edge of the lens; this is known as retroflexion of the iris. Dislocation of the lens into the anterior chamber where it is held by the iris may also follow a severe injury. This usually requires removal of the lens, owing to the fact that circulation of the intra-ocular fluids cannot be maintained, resulting in secondary glaucoma. The lens may also be forced backward into the vitreous chamber where it may be held by the partially ruptured fibers of the zonule of Zinn or may float free in the vitreous and be seen as a white mass when the head is bent forward, when it usually appears in the pupillary area. In some instances the lens may be brought into the anterior chamber by having the patient hold his head down and forward. Eserin is instilled while the patient is in this position. Later the lens may be transfixed with a needle and removed. Dislocation of the lens into the posterior chamber is the oldest operation for the treatment of cataract and is called "couching." In some cases no marked impairment or apparent disturbance of vision occurs. However, since glaucoma seems more likely to affect this eye than the normal eye, the lens should be removed if it can easily be done.

Cataract frequently results from these injuries because of a partial rupture of the capsule of the lens which permits the entrance of the aqueous with power to dissolve lens fibers. This may result in complete dissolution of the lens, or the lens may become partially opaque in some areas. If the opacity involves the pupillary area it is usually advisable to extract the lens in

older patients, and needle it in patients under twenty-five or thirty years of age.

The Chorioid.—The chorioid frequently becomes ruptured owing to stretching of the eyeball, as the chorioid is firmly attached anteriorly and there is a firm attachment posteriorly around the optic nerve. The rupture frequently appears as a crescentic lesion between the optic nerve and the macula. In the early stages rest and atropin provide the only measures of relief for this type of injury. But owing to the fact that a hemorrhage usually occurs from injury of the chorioidal vessels, rupture is, as a rule, not diagnosed until later.

When the hemorrhage occurs beneath the chorioid, the chorioid and retina may bulge forward and the lesion appear as a brownish red tumor covered by retinal blood vessels protruding into the vitreous. Chorioidal detachment by hemorrhage offers a better prognosis than retinal detachment, in that absorption of the hemorrhage usually occurs, leaving very little if any disturbance of eye function.

The Retina.—The retina as well as the chorioid may be ruptured, but because the former is more elastic, it ruptures less frequently than the chorioid. Traumatic detachment of the retina is extremely common; it should be treated by rest and cold applications in the early stages, with the head elevated if the detachment is below, and with the head on a level if the detachment is above. Subconjunctival injections of normal or hypertonic salt solution are of value in this condition. If reattachment does not take place, trephine of the sclera and sucking out of the subretinal fluids may be attempted. Unless there has been a tear in the retina, good results are sometimes obtained. We do not hesitate to operate several times, even though the detachment reoccurs. One should also consider the treatment of complicating focal infections, particularly those affecting the nose and nasal sinuses, as these conditions may influence the outcome in a case of traumatic detachment.

A grayish white opacity of the retina, known as commotio retinae, is frequently noted as a result of injury. This gray opacity occurs in the region of the macula which appears dark red in comparison with the surrounding edematous retina. Although the vision may be markedly affected at first, it usually improves rapidly. Sometimes atrophy of the rods and cones results; the pigment epithelium may proliferate into the retina and appear as brownish yellow patches scattered around the injured area. In some cases, there is a shallow hole in the region of the macula, the macula appearing deep red with a gray, slightly elevated edge of the retina surrounding it. Since this is probably due to edema and degeneration of the nerve element surrounding the macula, it is usually observed some time after an injury.

Optic Nerve.—A light blow on the eyeball may set up a low-grade traumatic inflammation of the nerve giving rise to congestion of the nerve head with possible blurring of the margins. In these cases field studies usually show a slight enlargement of the blind spot, and in some cases when the intra-ocular portion of the optic nerve is not involved, there may be a retrobulbar traumatic neuritis and enlargement of the blind spot may be the only sign which can be noted. If the injury is sufficiently severe, the nerve fibers may be torn away, resulting in evulsion of the optic nerve. The nerve fibers are less elastic than the sheath, which possibly accounts for this anomaly.

Traumatic Enophthalmos.—Traumatic enophthalmos occasionally follows contusion of the eyeball and orbit. Sometimes it occurs immediately after the injury but usually several weeks elapse before it becomes apparent. The condition most frequently encountered is a cicatricial contraction of the orbital tissue or an indirect fracture of the rim of the orbit with depression of the fragment of the bone outward so that the volume of the orbit is enlarged. Several cases have been reported in which no fracture of the orbit could be demonstrated.

Treatment naturally depends upon the exact anatomical cause of the enophthalmos. To lessen the enophthalmos Seefelder tenotomized the four recti which did not produce diplopia and left a fairly movable eyeball. A roentgenogram of the region should be made in order to determine whether or not the orbit has been fractured.

Sympathetic Ophthalmia.—Sympathetic ophthalmia has been reported following concussions and injuries of the eyeball. Uveal pigment has been used in the diagnosis of this condition but the complement-fixation test for uveal pigment described by Woods in 1917 and modified in 1921 has been discarded by him as impractical except for research work, and the intracutaneous test for pigment hypersensitivity substituted. Woods and Knapp were the first to treat sympathetic ophthalmia by desensitizing injections of uveal pigment in patients showing increased intradermal sensitivity. They treated 5 patients with desensitizing injections, and their results were encouraging, but as yet they do not wish to draw conclusions.

If sympathetic inflammation is due to an infection, as some believe, non-specific protein therapy may prove as beneficial as uveal-pigment injections, and Verhoeff has apparently had good results with non-specific treatment.

Secondary Glaucoma.—Secondary glaucoma may immediately follow an injury or may be delayed for months or years. Any trauma which disturbs the anatomical relationship so as to cause a shallow anterior chamber, or to obstruct the angle with a resultant blocking of the excretory channels, tends to produce glaucoma. An intra-ocular hemorrhage, especially if subchorioidal, frequently causes the retina and chorioid to be pushed forward in front of the effusion of blood, closing the angle of the anterior chamber by pressure from behind and causing a rapid rise of the intra-ocular pressure as a result of the sudden increase of ocular contents.

Many other types of injury tend to bring about an increase in intra-ocular tension. Among these are rup-

ture of the cornea with entanglement of the iris, producing an obstruction of the filtrating angle. Dislocation of the lens in such a manner as to cause interference with the outflow of aqueous current may induce secondary glaucoma.

Iridocyclitis, which frequently follows an injury, may precipitate an acute attack of glaucoma at any time. Acute glaucoma, coming on soon after an injury, is more easily recognized as the condition is usually accompanied by intense congestion, pain, loss of vision, and haziness of the cornea.

However, we must not lose sight of that type of glaucoma which comes on insidiously after many weeks or months, unaccompanied by pain or discomfort, but causing a steady loss of vision. The treatment must first be symptomatic; the tension must be lowered or vision will be lost. But above all else we must correct the cause, if possible.

Penetrating Injuries of the Eye. While any of these conditions may be caused from concussion of the eyeball, penetrating injuries of the eye, as pointed out by R. H. Newman[6], are as important as penetrating injuries of any other viscus, although they rarely, if ever, cause death. There is always more or less interference with vision on account of injury to the various structures concerned in the visual function. Penetrating injuries of the brain, peritoneal cavity, or pleura, are serious in that the agent producing the wound is infectious, leading to meningitis, pleurisy and peritonitis. In the eye the same condition obtains, infection introduced into the cavity of the globe finds in the aqueous and vitreous ideal culture media and on account of absence of blood vessels in these fluids there is little, if any, attempt to wall off and confine the infection, once introduced. Foreign bodies in contact with the retina may be walled off and remain for years in situ without causing any disturbance whatever, but the foreign body

(6) J. Tennessee M. A., January, 1929.

unattached is a constant source of irritation and sooner or later will destroy the vision and cause removal of the eye. Therefore, every foreign body should be removed, if possible through the wound of entrance with giant magnet, if that is not feasible on account of the depth of the foreign body, then through an incision made near the foreign body, then extract it with hand magnet or insert a small magnetizable instrument down to the foreign body and in turn magnetize it with hand magnet and often the foreign body comes away. This procedure presupposes an accurate localization of the foreign body with *x*-ray.

If the foreign body is near the posterior pole of the eye, it is much better to make an incision over the foreign body and try to remove it by the posterior route than to attempt to drag it back through the anterior segment of the eye. With a foreign body in the interior of the eye, the first objective is to remove it. Finding removal impossible, the eye should be enucleated. It is much better for the eye to suffer what seems to be an unusual amount of trauma and remove the foreign body if an attempt is made to prevent removal of the eye. In penetrating wounds through the cornea where the foreign body does not remain in the eye, the ordinary problem presented is prolapse of the iris through the wound. If the wound is fresh and there has been little chance of contamination, an effort may be made to reposit the iris. If the case is seen some time after the injury and there is reason to believe there has been a good chance for infection, the prolapsed part of the iris should be gently teased away from the lips of the wound, the prolapse incised, the iris reposited, and if the corneal wound is gaping, a conjunctival flap is dissected up and sutured across the cornea and allowed to remain for three or four days after which time it will retract and the corneal wound will be found to have healed.

Wounds of the sclera, especially through or near the ciliary body, are more serious as these occur in the clas-

sical danger zone of the eye. Wounds of the ciliary body are always more likely to destroy the eye on account of a traumatic cylitis and always bear an unfavorable prognosis. If the wound in the sclera is large and gaping, a suture should be inserted through the superficial layers of the sclera to close the scleral defect, after which a broad conjunctival dissection should be made and a sliding flap drawn over wound. If the tension of the eye is materially reduced on account of loss of vitreous, it is well to inject normal salt solution through the wound with hypodermic syringe. This brings the eye up to normal tension, prevents prolapse of retina, and many times has proven very satisfactory.

Injuries to the lens, be they ever so small, are always followed by swelling of the lens material and the resulting traumatic cataract. If during the stage of intumescence there is considerable pain and increased tension, this must be relieved by keratome incision and expression and removal by irrigation of as much as possible of the swollen lens substance. Many times following this procedure a fairly useful eye may be obtained. If this procedure is not made necessary by the swelling of the lens, after the eye is quiet, the lens may be needled to so aid absorption, improve the vision as well as for its cosmetic effect. These cases should all be treated with the strictest regard to aseptic and antiseptic precautions. They are distinctly surgical cases of the first degree. After the work of repair is completed, it is well to fill the eye with atropin ointment, keep the pupil dilated to its maximum during the treatment, and immediately begin the injection of some foreign protein. Newman injects sterile milk at the time of operation and repeats it every second day for four or five doses. Also, he gives from one to two drams of sodium salicylate every twenty-four hours, depending upon the constitutional reaction and size of the patient. If upon dressing the patient on the third day the reaction is not marked, hopes of a favorable recovery are bright, but we must

always be looking for infection and panophthalmitis, which means the eye must be enucleated.

In the presence of marked infection of the eye, increased pain, increased tension, the eye should be removed without waiting for the chance of infection of the fellow eye. Sympathetic infection is a great bugbear in these cases. We may drift along for years and have no unfortunate cases of this type, and are lulled to a sense of false security and get to believe that the literature on this subject belongs to ancient mythology, when suddenly we are awakened to the dread realization that this condition has occurred in our practice and find our patient has lost not only one eye but both eyes. Any eye that has been subjected to penetrating injury should be kept under careful observation not only for months but for years and at the first sign of any inflammation or irritation which we are sure comes from the interior of the eye, this eye should be removed, but with the treatment outlined, we have done our utmost to ward off infection in that the wounded eye is treated as a distinct surgical entity, the wound is closed and treatment for infection is instituted before its presence is made known. Prophylaxis is very important in that the infection is treated before it has had a chance to become disseminated. Wounds of the interior of the eye rarely, if ever, cause tetanus. Wounds of the soft structures in and around the orbit do cause tetanus and these cases occurring in suspicious surroundings should always have injection of A. T. S. and this injection repeated after ten days.

Perforating Eye Injuries of Young Children. Frank H. Rodin[7] calls attention to the frequency of injuries in very young children. Perforating wounds of the cornea are seen most frequently in very young children, who have injured themselves, or have been injured by their playmates, by knives, scissors, forks, and needles. There is usually present prolapse of the iris. If the cornea is

(7) California & West. Med., November, 1928.

perforated and has no lacerated edges, the wound closes rapidly, incarcerating the prolapsed iris. Injury to the lens capsule or the lens is very common, with the formation of a traumatic cataract. If the wound is large enough there may be escape of the lens with loss of vitreous humor. If the injury also involves the sclerocorneal margin there may be escape of vitreous humor.

If the wound has become infected, other dangers are added: iridocyclitis, hypopyon keratitis, endophthalmitis and panophthalmitis. Wounds at the sclerocorneal margin present an added danger because of the frequent injury to the ciliary body, with the possibility of sympathetic ophthalmia in the other eye.

In treating perforating corneal injuries it is most important that the eyeball and the eyelids be properly cleansed. In children this is best done under general anesthesia. The surrounding tissue should be cleaned with soap and water and the conjunctival sac thoroughly lavaged with physiologic saline solution or some suitable antiseptic solution. A solution of mercuric chlorid, 1:5000 may be used. Atropin solution should be instilled to combat any iridocyclitis. Simple uncomplicated incised wounds heal very rapidly. A prolapsed iris should be replaced or excised. The margins of the corneal wound should be trimmed if they are very rough and irregular. A bandage should be applied to the eye and the patient confined to bed. Ice compresses may be applied. If there are any signs of inflammation parenteral injections of milk should be given.

If the injury is so extensive that there is no prospect of preserving an eye in a serviceable condition, enucleation should be done at once.

Metallic Intra-Ocular Foreign Bodies Not Demonstrable on Roentgenograms. The impression is rather widespread among ophthalmologists that the presence of an intra-ocular body can be readily ruled out in the absence of shadows on a roentgenogram. It seems too obvious to require proof that a foreign body large enough

to cast a shadow could easily be found on a properly made roentgenogram when present in the eye.

Two cases are reported by N. M. Black and F. H. Haessler[8], however, that emphasize the fact that occasionally rather large intra-ocular foreign bodies do escape detection by this measure.

In the first case, a man thought that he got a piece of galvanized iron into his eye about a year previously. During this time the eye had become painful and bloodshot for short periods off and on. When examined, the globe was markedly congested, most severely circumcorneally. The cornea was clear, and the anterior chamber clear and of normal depth. The pupil was partially dilated and did not react to light or accommodation. On the iris near its pupillary margin, in the inner upper nasal quadrant was a small yellowish mass partially surrounded by a pigmented irregular cap, as shown in the accompanying illustration. In this region the iris vessels were dilated; elsewhere the iris stroma and blood vessels were normal. The lens was clear, except for a few radial striations. In the region of the iris mass the vitreous was hazy, and a sufficiently detailed view of the fundus could not be obtained. There were no gross fundus lesions. The vision was $^{20}/_{27}$ and could not be improved with a glass.

Careful examination of the eye with the slit lamp did not yield any further information of diagnostic value except that the binocular microscope gave a larger and clearer picture of the lesion. The pearl-like body seemed to be a solid fleshy mass, capped below by an intensely black mass, which was encrusted with small pigment clumps that had the appearance of pollen on a lily anther. In the interpretation of these observations, it seemed necessary to consider as pathogenic processes a reaction to a foreign body, tuberculosis, syphilis and neoplastic growth. On three roentgenograms, all of which were considered satisfactory by a competent

(8) J. A. M. A., Oct. 5, 1929.

roentgenologist, no evidence of an intra-ocular foreign body was found. The Wasermann reaction was negative. There was no general or focal reaction in the eye to repeated subcutaneous injections of old tuberculin in doses as high as 1 mg. It was assumed that these diagnostic procedures ruled out all of the etiologic processes. By exclusion, a diagnosis of sarcoma of the iris seemed established.

Under cocain anesthesia a broad sector of iris tissue which included the lesion was excised with the usual technic of an iridectomy. The eye healed uneventfully; the media became clear; the fundus was found to be normal, and with a correcting glass the visual acuity was $^{20}/_{20}$.

The iris tissue removed at operation was prepared for microscopic study, which showed a disintegrated mass on the iris surface in which fine granules were found which could be stained for iron. Verhoeff, who examined the slides, thought it was altogether impossible for any inflammatory process or tumor to be present other than that due to foreign body, and that it was impossible for this particle to have been in its present location for a year because the reaction around it was recent. The particle, therefore, either recently entered the eye or had been displaced from some other part of the eye and recently lodged in its present location. More sections were cut from the block and a piece of iron 0.08 by 1.2 mm. was dislodged. (Fig. 40).

In the second case, a man was wounded in the eye with a cotter pin. Except for conjunctival hyperemia the eye grossly seemed normal. A roentgenogram was requested in the belief that it would confirm a diagnosis of the absence of an intra-ocular foreign body. On an entirely satisfactory film, no evidence of foreign body was found. About seven weeks later the patient returned complaining that his eye was losing vision and was sensitive to light. A mydriatic was instilled and a careful inspection of the eye with the microscope re-

vealed in the upper nasal quadrant a healed, penetrating wound of the cornea, just inside the pupillary margin a tear in the anterior lens capsule, and a metallic foreign body in the anterior lens cortex surrounded by punctate opacities. There was also a large stellate, posterior, sub-

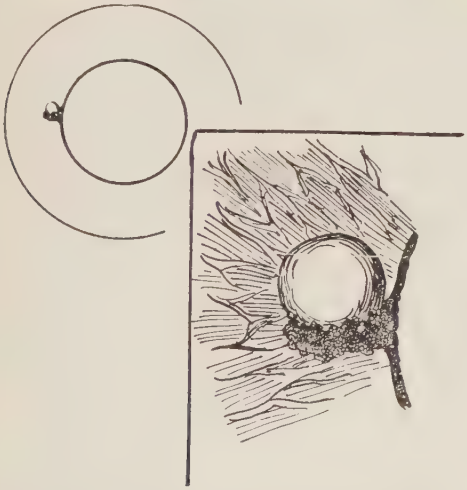


Fig. 40—Location of mass, shown diagrammatically at left, and details of mass, at right.

capsular, cortical cataract. The foreign body was easily dislodged into the anterior chamber with a magnet, and extracted through a keratome incision. The eye healed uneventfully, but the traumatic cataract became complete.

In each of these cases there was an undoubted intra-ocular foreign body of such size as is usually revealed by the roentgenogram, but for some unknown reason it was not found. Careful examination of the plates showed that the failure in diagnosis was not due to technical imperfections in the roentgenologic process.

In one of the cases, the foreign body remained in the iris for a year. In the other case a fresh intra-ocular fragment of iron lodged in the periphery of the lens,

was missed because a negative roentgenogram led them to assume that a thorough search for possible foreign body by other methods was unnecessary.

Ophthalmic Emergencies

Some Ophthalmic Emergencies in General Practice. The necessity for acting with promptness and decision in an emergency is the best test of the skill and resourcefulness of any man, and what is true of all is especially true of a practitioner, who, at any hour of the night or day, may be summoned to an urgent case.

If accidents in industrial life be excluded, serious ophthalmic cases occur very seldom in family practice; but they are so alarming when they do occur that the practitioner may well be excused for not feeling quite sure of himself when he is suddenly called upon for advice. Some general practitioners make no attempt to treat these cases. They say openly that they always send their eye patients to a specialist. That is not as it should be, and is very apt to convey a wrong impression. The public do not expect the family doctor to be a specialist, but they have a right to expect him to be capable of giving first aid in an emergency. As a rule a patient has implicit confidence in his family doctor, and when in trouble consults him straightway in the full assurance that he is not only willing, but able, to help. The doctor ought to know, therefore, what to say, what to do, and what to avoid doing when he is summoned to an urgent ophthalmic case.

A. Maitland Ramsay[9] offers some excellent guidance in these matters, emphasizing especially three outstanding examples: (1) An injury to the eye of a child. (2) A case of acute glaucoma. (3) The onset of sudden blindness in one eye.

An Injury to the Eye of a Child.—In this connection there are two things the family practitioner ought never

(9) Practioner, April, 1929.

to forget: first, that the fate of an injured eye will depend upon its treatment during the twenty-four hours immediately following the accident; and, second, that the parents will expect the child to see after it recovers from the injury. In any other part of the body, if a wound heals soundly, the presence of a cicatrix is usually of little consequence; but there must be no scar if the functional integrity of the eye is to be preserved. The practitioner's responsibility is very great. He must, therefore, never allow himself to be infected by the atmosphere of nervousness in which he will be enveloped as soon as he enters the patient's house. When every one is excited and apprehensive it is absolutely necessary for the practitioner to keep cool and collected. He should be particularly careful to say as little as possible until he has completed his examination of the patient.

His first duty is to inquire fully into the history of the accident, because by that means he is likely to learn a great deal regarding its nature. A good clinical history is always a great help towards a correct diagnosis. For example, an injury will vary according to the character of the object with which the eye was struck—a stone, a fork, a knife, a pellet from a toy pistol, to name only a few of those most frequently responsible. While the history of the case is being taken the child should be laid on its back in a good light, and told to keep both eyes shut. If a few drops of 2 per cent solution of cocain be placed in the hollow at the inner canthus they will find their way into the conjunctival sac with every slight movement of the lids, and the eye will be anesthetized by the time the doctor is ready to examine it. Cocain will be of little use, however, if the child be very nervous and frightened, and in these circumstances a general anesthetic will be required. It is very unsatisfactory to try to examine the eye while the child is screaming and struggling.

The skin should be inspected in the first instance and the tension of the eye estimated by gentle palpation

with the finger before making any attempt to separate the lids. If the tension be greatly reduced the eyeball has almost certainly been perforated, and it is well to be aware of that fact as soon as possible in the course of the examination. With antiseptic precautions the lids should be separated to get a good view of the eyeball. It is hardly necessary to say that all rough and awkward manipulations must be avoided, and if a retractor for the upper lid be not available, a serviceable substitute can be improvised by bending a hairpin. The conjunctival sac should carefully be explored. It is very unfortunate to overlook a foreign body in the retrotarsal fold or beneath the upper lid. Aided by a good light, the cornea must be examined for any abrasion of its surface. If nothing more than a superficial abrasion be discovered, all the treatment necessary is to instil a few drops of 10 to 20 per cent solution of argyrol and to apply a compress and bandage. Argyrol is advised, not on account of its reputed antiseptic properties, but because its solution is so heavy that it finds its way into every part of the conjunctival sac and acts as a thorough scavenger. If septic infection of the abrasion be avoided, the epithelium of the cornea will be reproduced very rapidly and no scar will remain.

When the accident is more serious it is convenient to divide the cases into two groups—those in which there is no perforation, and those in which perforation has occurred.

(1) *When the eyeball has not been perforated.*—The chief signs to look for in making a diagnosis are as follows: (*a*) The anterior chamber is full; (*b*) the pupil is circular and responds to the stimulus of light; (*c*) the tension of the eyeball is normal. First aid must be given without delay. Instil argyrol and apply a compress and bandage. In this group of cases, however, the injury to the cornea is usually extensive and deep, consequently there is considerable danger that sight will be affected as a result of opacity or of irregular astig-

matism of the cornea. Moreover, there is always a risk of sepsis, consequently it is prudent to keep the patient in bed. Rest is essential for the smooth healing of all injuries. In other parts of the body recourse is usually had to the support of a splint, and the same principle applies to injuries of the eye for which atropin is the physiological splint. It can be used in 1 per cent solution and is usually instilled after the argyrol. The timely use of a mydriatic is the best preventive treatment of iritis, which is one of the most dangerous complications of this group of injuries. As a rule no further treatment will be necessary, but whenever the injury appears so severe that sight is likely to be damaged, the family doctor will be well advised to ask for a consultation with a specialist before any complications arise.

(2) *When the eyeball has been perforated.*—It is essential to obtain a good view of the eyeball. When the eye is properly seen the diagnosis is not difficult if attention be paid to the following signs: (*a*) The anterior chamber is empty; (*b*) the pupil is contracted and irregular in outline, and does not respond to the stimulus of light; (*c*) the iris is usually prolapsed through the wound in the cornea; (*d*) the lens may be wounded. It is important to take note both of the outline and of the general appearance of the pupil. A prolapse of the iris may be difficult to see and can easily be overlooked; but even although the actual prolapse may not be seen, it is a sure sign if the pupil has a pyriform shape. This special alteration in the outline of the pupil is due to the iris having been drawn into the lips of the wound of the cornea. If further examination shows that instead of being jet-black the pupil presents a grey reflex, the diagnosis of traumatic cataract can be made with confidence.

In these circumstances the eye is in grave danger, and the family practitioner, after rendering first aid, ought to rid himself of any further responsibility by transferring the case to a specialist at the earliest possible

moment. The prognosis, however, will depend upon the first-aid treatment, which ought always to be as simple as possible. There should be no unnecessary handling of the eye, and copious douching, the use of strong antiseptics or of lotions containing lead must be avoided. A 10 per cent solution of argyrol may be used freely, and if there be a prolapse of iris towards the centre of the cornea, 1 per cent solution of atropin should be instilled, but if the prolapse be at the periphery of the cornea, 1 per cent solution of eserin ought to be employed. The object of the treatment in both instances is to replace the iris into the anterior chamber by pulling it free from the lips of the wound in the cornea. A prolapse of iris is always a source of grave danger, but the family practitioner should never try to excise it. The operation is not so easy as it may appear, and to ensure success the operator requires to have considerable experience of opththalmic surgery and also to possess suitable instruments. The skin of the eyelids and side of the face should be painted with a 1 per cent tincture of iodin, a compress and bandage applied to the eye, and the patient put to bed to await the arrival of the specialist, or sent to him forthwith for further treatment. It is quite likely that the child's parents may express the wish to wait for a day or two before consulting a specialist, but the family practitioner ought not to approve of delay. Serious complications may occur very unexpectedly, and when they supervene the eye may be lost, even although the subsequent treatment has been directed by the highest skill. There is always danger ahead, because it is in perforating injuries that sympathetic inflammation is prone to attack the uninjured eye with the tragic result that sight may be lost in both eyes.

A Case of Acute Glaucoma.—No excuse is necessary for including acute glaucoma among the emergencies of general practice. In many instances it comes as a bolt from the blue. The patient—very often a woman about

50 years of age—goes to bed apparently in her usual health, but is awakened in the early hours of the morning by agonizing pain in the head accompanied by feverishness, nausea, persistent retching, and bilious vomiting. The symptoms are so alarming that the family practitioner is called in haste, and unless he knows well what he is about he may easily do more harm than good. When he arrives at the patient's bedside it is quite probable that no one will mention the eye; all attention has been concentrated on the general symptoms, so that even although failure in sight has been noticed it has been tacitly assumed to be due to biliousness. The true nature of the condition may very easily be overlooked, and if the practitioner be deceived the result will be deplorable. In such circumstances the possibility of acute glaucoma should always be kept in mind. It is not by any means a common disease, and a practitioner may be in practice for many years before he is called to a case. Nevertheless, every country practitioner ought to know about glaucoma, and be able to recognize the disease when he meets it. If he does not allow himself to be taken unawares there is not much difficulty in the diagnosis. The most important factor is to remember to examine the eye. It is when the practitioner omits to think about glaucoma that its presence escapes him.

The patient shrinks from the slightest touch, and may say that his eye feels too big for its socket. On palpation it feels hard as a stone. The bulbar conjunctiva is congested and edematous; the cornea is steamy and so insensitive that it can be touched without the patient's knowledge; the pupil is dilated, irregularly oval shaped and irresponsive to light; the anterior chamber is shallow and sight is seriously impaired.

At this stage of the examination the practitioner must be on his guard not to misinterpret the significance of these signs and symptoms. The hardness of the eye, the dilated pupil, the shallow anterior chamber, and the loss of sight ought to be sufficiently diagnostic to

prevent acute glaucoma from being mistaken for any other disease. Unfortunately, however, the unwary frequently confuse glaucoma and iritis, with deplorable results. It is common knowledge that in iritis the vigorous use of atropin is imperative; but it is not so well known as it ought to be that if a mydriatic be instilled into an eye suffering from glaucoma the symptoms will be so gravely aggravated that the prospects of recovery are very materially lessened. Few errors in diagnosis and treatment are followed by such disastrous results. The subject is so important that repetition may be excused, and to sum up briefly, bear in mind especially:

(1) When the family practitioner is summoned to an urgent case, in circumstances such as have just been described, he ought always to bear glaucoma in mind, and be quite sure he has excluded that disease before he commits himself to any other diagnosis.

(2) Until it is certain that there is nothing wrong with the eye, the possibility of acute biliousness or migraine being the cause of the attack ought never to be considered.

(3) While retching and vomiting are usual accompaniments of acute glaucoma, these symptoms are so exceedingly rare in iritis that their presence should be sufficient to put the practitioner on his guard and make him examine the eye with great care. If he does so he will never confuse glaucoma with iritis.

After he has made a diagnosis the practitioner need not have much difficulty about the treatment. As a result of the increased intra-ocular pressure the patient is suffering agony and rapidly losing sight. The indications for treatment are to relieve pain and to contract the pupil. Morphia, our sheet anchor in so many emergencies, is invaluable in acute glaucoma. It should be given in full dose by hypodermic injection and its sedative action can be assisted by fomentations and by leeching. It is also very important to get the bowels to move freely as soon as possible, and nothing is more

effective than calomel followed by a saline draught. To contract the pupil and to reduce the tension of the eye the most convenient remedy is eserin 1 per cent solution, repeated every two hours. The patient should be kept warm in bed and encouraged by the hope that the symptoms will be relieved after a sound sleep. Although it is wise to speak to the patient in a very reassuring manner, the practitioner, before he leaves the house, ought to tell the relatives that the condition of the eye is serious, and to warn them that on the following day an operation may be necessary. Sleep is Nature's cure for glaucoma, and if the patient has had a good night the eye will probably be much better when he wakens in the morning. If, at his morning visit, the practitioner finds the pain relieved and the pupil contracted he can safely continue the treatment; but if, on the contrary, he finds the general symptoms acute and the pupil dilated he should not hesitate to ask for a consultation with a specialist. He cannot accept responsibility for delay. The circulation of the intraocular fluids has become strangulated; and, if the increased pressure be not relieved promptly, serious impairment of sight, terminating in many instances in blindness, will inevitably result. The hopelessness of the situation can, however, be removed by operation provided action be taken in time. The state of the eye in acute glaucoma has been compared to a strangulated hernia. The analogy is apt, and if it be remembered the family practitioner will never on his own responsibility counsel delay because he will readily understand that relief to strangulation is as imperative in the eye as it is in the bowel.

The Onset of Sudden Blindness in One Eye.—The dread of blindness has been the predominating note in the description of the two ophthalmic emergencies which have just been considered, but in this third group the loss of sight is an accomplished fact before the practitioner sees the patient. Suddenly, and without warning,

sight is completely lost. It is the sudden onset which distinguishes this group of cases from all others. A patient discovering by accident that he is blind in one eye promptly consults his family practitioner in the belief that the loss of vision is recent and sudden, whereas an examination of the eye reveals that the amblyopia is either congenital or the result of chronic disease of the optic nerve. It is obvious that these cases cannot be included in the present category. The patient we have in mind can either tell the exact time and mode of onset of the seizure, or will say that he noticed a blur before one eye on first waking in the morning. The frequency with which the loss of vision occurs during the night is one of its characteristic features, and brings the ocular phenomena into line with sudden seizures in the brain and other parts of the body. If the practitioner can use the ophthalmoscope he will very quickly arrive at a definite diagnosis of the pathological condition actually present in the fundus oculi. It is unfortunate that so many are content to leave the use of the ophthalmoscope to the ophthalmologist. An electric ophthalmoscope, equally with a stethoscope and a clinical thermometer, ought to be part of the ordinary outfit of every general practitioner. A certain amount of training and experience in the use of the instrument is doubtless required, for it is necessary not only to be able to see with the ophthalmoscope, but also to be able to interpret what is seen. To have actually examined the fundus oculi for one's self is a great help in diagnosis, even although later on the lesions are more fully described and their significance explained by an expert. The fact that the family practitioner does not possess an ophthalmoscope ought not to prevent him from making a thoroughly satisfactory examination of the patient. He will gain all the information necessary for first-aid treatment by testing the field of vision. He requires no instruments, because an examination sufficient for clinical purposes can be made by the hand. The patient should stand facing

the examiner with his back to the light, and at a distance of about two feet. Each eye must be examined separately, and while one is being tested the other should be carefully covered. The patient should look fixedly at the examiner's nose, while the latter, holding his hand mid-way between himself and the patient, moves his outstretched forefinger from the periphery towards the centre of the visual field. The patient is told to say whenever he sees the movement of the finger. Both the examiner and the patient should see the movement of the finger at the same moment, provided that in both the field of vision is normal. The movements of the hand are repeated in the different meridians of the field until it has all been explored. By this simple method the examiner compares the patient's field of vision with his own, and any differences in their extent are at once detected. This examination enables the doctor to discover whether the blindness of which the patient complains is complete or partial, and if partial whether the defect is in the centre or in the periphery of the field of vision. That knowledge enables him to classify his patients into three groups.

(1) *The Whole of the Field of Vision is Lost.*—The patient has suddenly become blind in one eye. That as a rule means that something has gone seriously wrong with its main blood supply. The most usual clinical manifestations are embolism of the central artery of the retina, thrombosis of the central vein, and profuse intraocular hemorrhage. When confronted with such an emergency the family practitioner may at once remember that the patient had rheumatic fever in childhood, or that he is at present suffering from glycosuria, albuminuria, or high blood-pressure. That knowledge will enable the practitioner to understand the meaning of the association of symptoms, and to offer a satisfactory explanation of them to the patient. There is no necessity to be too pessimistic in the first instance, because, whether he can use the ophthalmoscope or not, the prac-

titioner will be well advised to seek a consultation with an ophthalmologist, whose larger experience of the local conditions ought to be helpful in assessing the prognosis. The family practitioner should, if possible, be present at the consultation with the specialist, because, although the latter will be most helpful in diagnosis and prognosis, the position will be reversed when treatment is discussed. It is then that the family practitioner's intimate knowledge of his patient's medical history should be invaluable, consequently in the interest of the patient he ought never to dissociate himself from the treatment. The best results are most likely to be got when the specialist and the family doctor collaborate.

(2) *Central Vision is Lost, but Peripheral Vision is Preserved.*—The patient can see nothing straight in front of him; he is unable to read, to thread a needle, or to recognize the face of a friend. He can see objects round about him, but everything he looks at is a blank. At other times a black spot in the line of vision hides the object he wants to see. The presence or the absence of this black cloud is very important in differential diagnosis. If, for example, a patient on awakening from sleep discovers that he is seeing imperfectly with one eye, and complains of a black spot in the line of vision, a hemorrhage has occurred in front of the macula, whereas if he simply cannot see what he looks at, no obstacle being visible in the line of vision, he is suffering in all probability from a localized inflammation of the optic nerve.

(3) *The Defect is in the Periphery of the Field of Vision, but Central Vision is Retained in Whole or in Part.*—In an emergency consultation the patient usually complains either of a blind side, right or left, or that he cannot see when he looks upwards or when he looks downwards. He suffers from hemianopsia, which may be either of cerebral or of retinal origin, and, although there are exceptions, it may be stated as a clinical axiom that, when the dividing line between the blind and the

seeing portion of the retina is vertical, the hemianopsia is the result of hemorrhage in the visual pathway on the opposite side of the brain, whereas when the dividing line is horizontal the cause is likely to be detachment of the retina or an obstruction in a large branch of the retinal circulation. It is hardly necessary to point out that in hemianopsia of cerebral origin both eyes are always affected.

The onset of migraine is sometimes heralded by a transient attack of hemianopsia, but its brief duration and the sequence of the symptoms are so characteristic that a practitioner is not likely to have any difficulty in arriving at a correct diagnosis.

Ophthalmic Therapeutics

Rôle of "Three T's" and "Reform Diet" in Ophthalmology. For the past ten years, George Huston Bell[1] has been preaching his doctrine of the "Three T's:" teeth, tonsils and toxemia, in their importance on conditions. In his last paper, he enlarges on the subject by adding a "reform diet" which, if faithfully carried out, he thinks will prevent the occurrence of many of the intestinal toxemias which undoubtedly are the underlying cause of many pathological eye conditions. Bell's discussions on the teeth and tonsils have been reviewed in a previous volume of the "Practical Medicine Series." As there is a growing demand for a scientific supervision of the diet, both in health and disease, his advice on this subject is worthy of record here.

The Use of Foreign Proteins in the Treatment of Diseases of the Eye. The consideration of treatment by foreign proteins has, within the last decade, taken a prominent place in medical circles. Much time is given to the discussion of clinical results, experiments have been carried out to determine the character of the reaction to proteins, and synthetic products have been

(1) M. J. & Record, Feb. 6, 1929.

marketed with statements as to their efficacy by physicians who have used them.

Attention has been focused on the action of proteins on the reticulo-endothelial system, on the production of antibodies, and the probable rôle played in the stimulation of the production of antibodies or antibody exfoliation. The clinical and physiologic effects of parenteral injection of protein substances have been studied and correlated with symptoms from a modern standpoint, and although carefully scrutinized from a scientific point of view, proteins are still given on an empiric basis.

The way in which foreign proteins act to bring about a stimulation of healing in tissue which is locally infected has been the object of much study, and several theories have been advanced to explain it. Without entering into a consideration of these theories Wm. L. Benedict and Charles Rucker[2], who have carried on extensive researches in this line, go on to say that proteins administered parenterically are probably diffused throughout the body, and as they come in contact with a large number of body cells whose walls are permeable they set up chemical reactions within these cells which in turn produce a ferment that stimulates antibody formation or "exfoliates" a large number of antibodies already formed. The benefit produced by parenteral administration of any foreign protein is therefore determined by this activity of the body cells. There is reason to believe that such action is limited in the case of most of the foreign proteins commonly used. Some proteins are destroyed by the body almost as soon as they are taken up by the blood without producing any reaction that can be recognized, while others produce mild reactions sometimes with slight fever. When proteins are used for their therapeutic effect in diseases of the eye, the specific effect is not essential. Only the cells in the vicinity of the lesion are sensitized to the invading organism and they do not throw off enough antibodies to

(2) New Orleans M. & S. J., May, 1929.

bring about healing. Under favorable circumstances, the production of exfoliation of a large number of antibodies of another toxin when thrown into the blood stream will augment the action of whatever specific antibodies are already present and help to turn the indolent or nonhealing lesion into a healing one or at least help to retard its progress. It is on the basis of this phenomenon that foreign proteins are used in ocular therapeutics and that the choice of proteins which may be used is not limited.

Vaccines are given in small doses and are intended to raise an immunity to disease. They are specific proteins which presumably stimulate the formation of antibodies in small numbers. They are of little benefit in combating a disease that is once established and they may do definite harm. They have definite and proved value in ocular therapeutics but have fallen into disrepute largely through misapplication. A non-specific effect is also derived from vaccines; this is noticeable if the dose is large or the patient sensitized, but in the dosage usually employed their action is slight in comparison with other proteins. They are to be employed at weekly intervals for several weeks or months, after the acute stage of a disease of the eye has abated. Vaccines should be used to produce a high degree of immunity to a particular infection, whereas other foreign proteins should be used to effect immediate action in an acute condition. Vaccine should stimulate the formation of specific antibodies, and other foreign proteins should stimulate the formation of non-specific antibodies.

The substances which these two authors have used in the cases referred to here are milk, typhoid vaccine, and antidiphtheritic serum. Milk was most frequently chosen for injection because of the freedom from severe reaction or anaphylaxis.

Primary Uveitis.—In the more severe attacks of primary uveal inflammation, foreign protein seems to allay pain and bring about a feeling of comfort in the

eye that is appreciated by the patient even though this is gained through a general reaction, often accompanied by headache, malaise and fever. In many cases the congestion leaves the eye, and the anterior chamber becomes clearer after the first injection. The results, however, are not uniform. Of seventeen cases of primary uveal inflammation good results were obtained by protein injection in thirteen; improvement did not occur in four. One of the four patients was a young man who suffered an acute attack of iritis while he was being treated for prostatitis. He received only one injection of 10 c.c. of milk and was unable to stay for further treatment. The second was a man aged 63 who had had chronic iritis for one year. Both eyes were affected and vision reduced to 4/60 in the right eye and 6/60 in the left eye. In the course of one month, ten injections of 10 c.c. of milk each were given. On only three occasions did the temperature rise above 99 following the injection. Pain continued in the right eye. Three injections of typhoid vaccine were given followed by a course of streptococcus vaccine. Large doses of salicylates, mercury, thyroid extract and other agents were used without any improvement. The right eye was enucleated about three months later, and found to contain a conglomerate tubercle involving the ciliary body and choroid with extension of the inflammation into the cornea and sclera. The left eye, however, which had been affected only slightly at first, improved under the treatment and when the right eye was removed the vision of the left had improved from 6/60 to 6/10. The patient died in May, and the cause was not ascertained.

The third and fourth cases were of middle aged men with bilateral uveitis which had existed for more than two years. One received only two injections of 10 c.c. of milk, the other injections of aolan. Prostatitis and dental infection of several years' standing were found in these two cases.

The best results were obtained in cases of iritis of

short duration, from two to thirty days, although improvement occurred in one of 150 days and another of 400 days. Four injections of 10 c.c. of milk each were usually given besides the local treatment to the eye. Of the thirteen patients who obtained good results from the treatment, three received typhoid vaccine and one antidiphtheritic serum after four injections of milk had been given and the eye was not clearing satisfactorily. The change in the protein may not have been the cause of the improvement, but the possibility must be considered.

The etiology of the disease could not be determined in three of the thirteen cases of iritis. Persons in whom a focus of infection could not be found, or in whom the etiology could not be determined, made the most rapid and most satisfactory improvement. A positive Wassermann reaction was not obtained in any case. It was believed that metastatic focal infection of the uvea was present. Tuberculosis may have been present in more than the one case mentioned but not diagnosed. In the cases in which treatment failed to be effective, either the treatment administered was less than is usually given or some active focus of infection, such as prostatitis, was present which could not be eliminated. In general, little improvement was noted in cases in which the disease had been active for several months or in which there had been several previous attacks. The best results were obtained in the patients seen early in the first attack. In this series the ages ranged from fourteen to seventy years; the age, therefore, was not a factor in the therapeutic effect of the injections.

Secondary Uveitis.—Iritis and iridocyclitis occur frequently after operations in which the eyeball has been opened, and after the eye has been injured. The severe cases are usually indolent and chronic and yield to treatment slowly if at all. The eye is often irritable and does not tolerate intensive local treatment. Focal infection probably contributes to the chronicity of the dis-

ease and if possible should be removed. The cause of the continued inflammation may not be bacterial, as, for example, an operation on the eye or a burn of the cornea or conjunctiva.

The results in this group depended largely on the complicating factors. In cases in which there was keratitis or corneal leukoma, the inflammation of the uveal tract was not diminished by the injections. One patient with secondary glaucoma was not benefited. As in the series of primary uveal inflammation, the injections of milk had less influence on the course of the disease if the exciting cause persisted.

Scleritis.—The most satisfactory result that has been noticed from the injection of milk has been the immediate effect on scleritis. This is a painful chronic disease characterized by remissions and exacerbations of congestion of the scleral tissues and often with sclerosing infiltration of the cornea. The iris, ciliary body and choroid are often involved in areas directly beneath the inflamed sclera. Scleritis is found most often in women, and usually begins shortly before the age of twenty and continues to reappear at intervals throughout life. The chronic or recurrent cases are said by Verhoff to be due to tuberculosis, although focal infection certainly may be considered as an etiologic or a contributing factor in many of them. The treatment of this condition heretofore has been unsatisfactory. Treatment with tuberculin has been found to do more harm than good in this disease, as is probably true in most other conditions of the eye for which it is administered. Benedict, Von Lackum and Nickel reported in a recent paper the results of investigation and treatment in a series of cases of scleritis associated with focal infection. Moench has studied the relation between scleritis and infection in the pelvic organs of women.

Cases of scleritis, which had existed for months with constant redness and pain, have been seen to clear up after two injections of 10 c.c. of milk. One patient had

been suffering from recurrent attacks of scleritis for more than twelve years. She had been told that the eye trouble was due to local tuberculosis and had been sent West from a large eastern city in the hope that the climate would be of benefit. The attack which brought her to the clinic was severe; the pain prevented rest, and the vision was failing. Two injections of milk followed by a course of autogenous vaccine resulted in complete disappearance of all symptoms and the vision was fully restored.

Another patient had had recurrent attacks of scleritis for ten years. On three occasions in as many years she has been hospitalized and given injections of milk. Each time the eye became clear after from one to four injections. Immunity was not produced by these injections. An exacerbation might follow within a few days after a successful course of treatment had been concluded. She refused to take vaccine because of a severe setback she had experienced a few years before while taking a course of tuberculin. She now gives a positive Mantoux reaction to 0.02 mg. of tuberculin.

Choroiditis.—Exudative choroiditis with vitreous opacities of obscure etiology may show improvement after treatment with protein is instituted. The changes take place more slowly than in cases of external inflammation. Definite improvement followed injection of milk in two cases in which treatment with other remedies had been without effect.

In one case in which the cause was obscure the vision of the affected eye was reduced to 1/60 by vitreous opacities which had existed for four months. Four injections of milk were given and there was a febrile reaction following each injection. The opacities cleared away rapidly and vision of 6/7 was restored in four weeks. A large lesion in the choroid in the lower quadrant of the eye was the evident source of the opacities. This area did not show activity at the end of the treatment. In a case of disseminated choroiditis of the left eye the

vision had been clouded for eight months and was reduced to 1/60 at examination. Four injections of milk were given with a resulting slight febrile reaction. This was followed by four pilocarpin sweats. Vision improved to 6/15 after four weeks of treatment. Large vitreous opacities remained, and there were many areas of choroidal atrophy at the periphery of the fundus. There was no evidence of activity. The significant feature of these cases is the rapid response to treatment after the condition has been stationary for many months. The improvement must be credited to the injection of milk, although other treatment was continued as well.

Penetrating Injuries of the Globe.—Cases of penetrating injury of the globe, in which a foreign body is not present in the eye at the time treatment is started, constitute a small list of considerable interest. If the eye is not infected at the time of injury the immediate effect of injection of milk is to allay pain and reduce congestion. Other general and local treatments should be given with or immediately after the course of milk, as the first improvement is of short duration. In one case of penetrating injury with a foreign body, probably with retention of a small piece of stone within the eye, sympathetic ophthalmia was imminent and large doses of diphtheria antitoxin were given. The eye has remained quiet. A case of panophthalmitis was not affected by the use of small amounts of milk. In this case larger doses might have been of some benefit.

Miscellaneous Lesions.—Injections of milk, typhoid vaccine and diphtheria antitoxin were used in a miscellaneous group of lesions, of the cornea and conjunctiva and in wound infection. Regardless of the duration of the disease or the age of the patient, the results obtained were not far different from those obtained by local and general remedies other than the injection of protein. Only hospitalized patients were given protein therapy, and few patients with corneal lesions required treatment in the hospital. It has not been the authors'

practice to use any injections unless the reaction can be observed, particularly if a febrile reaction is expected. Injections of milk were usually given at intervals of forty-eight hours, diphtheria antitoxin daily. Typhoid vaccine was given at longer intervals, depending on the severity of the general reaction.

Conclusions.—The histories of patients who have been treated with various proteins have been reviewed, and the following deductions have been made:

1. The age of the patient has no bearing on the result of the treatment.

2. Boiled milk is a safe protein to use. No anaphylaxis has been observed.

3. Some patients fail to react to injections of one protein. Other proteins may then be used.

4. Large doses of diphtheria antitoxin can be given daily for from twenty to thirty days.

5. Some chronic diseases of the eye respond to protein therapy; the treatment should be continued long enough with sufficient quantity of protein to determine whether or not there is any effect.

6. Protein therapy is an adjunct to general and local treatment, but has great value in early inflammatory disease of the eye and should be used freely in hospitalized patients. Its value is considerably less in ambulatory patients.

Ephedrin in Ophthalmology. The plant ma huang, a species of ephedra, has been in use in China for medical purposes for about 5,000 years. In 1887 Nagai extracted from the plant the alkaloid ephedrin. H. Campbell Orr[3], in his experience with this preparation notes that its action is similar to that of adrenalin, but it is slower in action and more prolonged in effect. It stimulates the nerve endings of the sympathetic system. Ephedrin is a cardiac depressant, but when injected intravenously or intramuscularly it causes vasoconstriction with resulting rise of blood pressure for a con-

(3) Practitioner, April, 1929.

siderable period. It can be sterilized by boiling without any alteration of the substance, and does not deteriorate by being kept for long periods.

In strengths of 1 per cent to 10 per cent ephedrin is a mydriatic. Mydriasis is complete in fifteen to thirty minutes. The effect of the drug varies according to age, state of congestion of the eye, the presence of synechiæ, and the amount of pigment. Dilatation is not so complete after middle age as it is before it. Where the conjunctiva or uvea are congested the dilatation is incomplete, but if combined with 1 per cent atropin in cases of iritis the action of the atropin is very much improved, and mydriasis results in many cases where atropin alone has failed; this action is well marked in postoperative iritis. In chronic iritis it will often break down recent synechiæ where atropin alone has been tried without success. Dark irides do not react to ephedrin so well as light irides, and 2 per cent solution may be needed for the former where 1 per cent is sufficient for the latter.

It is not a cycloplegiac, and even when fully dilated the pupils react slightly to light and on accommodation. Mydriasis passes off in about one hour. When accommodation is exercised the mydriatic effect passes off more quickly.

No blanching of the conjunctiva follows instillation, and no rise of tension results in the normal eye. In fifty glaucomatous eyes in which mydriasis was produced by instillation of 2 per cent solution, no rise of tension was recorded, and in twelve cases a slight fall was noted. The measurements were made with a Schiotz tonometer under holocain anesthesia. Ephedrin will produce mydriasis in the glaucomatous eye which is under the influence of eserin, and is in turn overcome by the instillation of pilocarpin 1 per cent, or eserin, grain $\frac{1}{8}$ to 1 ounce. Miosis results in five to ten minutes.

It is inferior to homatropin and cocain in that it is not a cycloplegiac, but has the advantage that its in-

fluence passes off rapidly and no rise of tension is produced. Cocain damages the corneal epithelium, but ephedrin does not. When instilled as a 1 per cent or 2 per cent solution it produces no discomfort, although instillation of 5 per cent solution has produced toxic results.

Although the number of glaucomatous eyes examined with the drug is small, the results so far suggest that it can be used to examine the fundi in these cases without evil after-effects. It appears to be the most suitable drug for ophthalmoscopic examinations in routine practice.

Color Fields. In the condition of cardiospasm, which next to malignancy is the most common lesion of the esophagus, J. E. Reeder[4] finds a symptom, frequently overlooked, namely, inversion of the color fields. He reports seventeen cases, in all of which this condition was more or less pronounced.

New Instruments

A Lamp for Eye Surgery. In many general operating rooms, the light is not well adapted for eye surgery. Daylight is uncertain. The most widely used lamps require rheostats for reducing the current sufficiently to supply a low voltage lamp; and this makes transportation cumbersome. Again, in case the bulb burns out, considerable delay and inconvenience may result before another can be procured. A nurse or untrained assistant holding a lamp often tires during an operation, and this may cause a serious accident by varying the illumination of the operative field.

Principally because of these difficulties, Carl T. Eber[5] devised the lamp illustrated here. (Fig. 41).

1. It is made of light weight material and can easily be carried in a bag.

(4) J. Iowa M. Soc., December, 1928.
(5) Am. J. Ophth., March, 1929.

2. The bulb is a standard 100-watt nitrogen lamp of blue glass giving a whiter light than the "clear" type, but in case of emergency any globe of similar size may be substituted. The metal shield gives the globe sufficient protection against breakage in carrying.

Fig. 41—Lamp for eye surgery.

3. The "goose-neck" has a clamp at its lower end which permits the instrument to be attached to any available upright (such as an irrigator stand) from one-fourth inch to an inch in diameter. (A handle with socket can be substituted for the "goose-neck," thus converting it into a hand lamp).

4. A limited amount of "focusing" is made possible by means of adjustable telescoped tubing containing two lenses.

The intensity and concentration of the light is not so great as in the "focal lights," but it is quite sufficient for eye surgery in the hospital and minor surgery in the office.

An Improved Retinoscope. Dissatisfaction with his

ability to see the pupillary shadow on the retina sharply and clearly, induced G. H. Cross[6] to improve the retinoscope by adding a plus one lens, such as is used in the Loring ophthalmoscope, situated in a circular well drilled in the main plate of the instrument directly over the hole in the plate and under the mirror. No extra ring or clamp is necessary to hold the lens in place, this being accomplished when the mirror is fastened to the base plate. It is practically impossible to scratch or break the lens thus fully protected on both sides.

This modification of the retinoscope will prove of great benefit and comfort to most refractionists past forty years of age who desire to see the pupillary shadow on

Fig. 42—Retinoscope adapted for presbyopic examiner—shown in cross section (Cross).

the retina sharply and clearly, so to have the best possible idea of its various movements.

The improvement can very easily be incorporated in the various electric retinoscopes as well as in this hand retinoscope. (Fig. 42).

[For several years the Editor has been using practically this same method in retinoscopic work. A small plus one lens held in place over the sight-hole by balsam of fir, that is used to hold the segment in bifocal lenses, produces the pleasing effect described by the author.—Ed.]

Monocular Magnifier with Skeleton Attachment. Thomas D. Allen[7] described a light and inexpensive adjunct for an amblyopic eye, to enable the eye to read at least coarse type. The principle was the same as in the telescopic spectacle or operating loupe. It consisted of two rings, which allowed it to be clipped over the regular spectacles, and an extension bar holding a plus

(6) Am. J. Ophth., February, 1929.
(7) Am. J. Ophth., January, 1929.

lens at a distance of four or five (usually 4.5) cm. from the spectacles. The lens might be made of any strength desired: a plus six sphere was usually best. (Fig. 43).

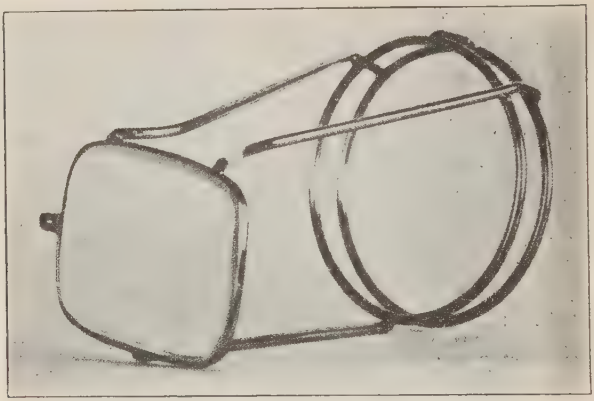


Fig. 43—Monocular magnifier (Allen).

The plane of the lens was parallel to the rings and therefore to the patient's glass, but set below the glass, in the reading position. It was thus not perpendicular to the line of sight, but so tilted to the line of sight as to obtain a cylindrical effect somewhat resembling that of reading glasses on the market. As it was square, nearly two columns of newsprint might be read without moving the head.

The skeleton attachment allowed the wearer to see elsewhere than merely through the lens. It could be quickly and easily removed and replaced; it was light in weight but substantial. It was only made in the monocular form.

The Ear

ALBERT H. ANDREWS, M.D.

THE EAR

Hearing Tests

The Use of the New Magnesium Alloy Tuning Forks. R. Sonnenschein[1] states that the following are some of the requisites of good tuning forks:

1. They should be made of one piece of metal.
2. The handle should be long enough so that it can be easily yet loosely held without damping or stopping the vibrations.
3. The forks should sound for a long time.
4. There should be weights on the lower pitched forks to avoid overtones.
5. Forks should not be nickeled.
6. If rustless metal is feasible, it should be used to prevent changes by oxidation.

The best forks have usually been unnickeled, but unless great care was used in handling them, and in protecting them from the moisture in the atmosphere, rusting took place and this changed the pitch. On the other hand, when forks are nickeled, the plating sooner or later begins to peel, and the vibrations of the loose pieces of metal give rise to adventitious sounds. For this reason, the Committee on the Standardization of Tuning Forks and Hearing Tests of the American Academy of Ophthalmology and Otolaryngology has been endeavoring among other things to find a metal or alloy which is rust proof and at the same time has sufficient elasticity so that it can be used in the making of first-class forks. A number of metals and alloys have been investigated, but none of them seem to possess the proper qualifications. Finally Mr. B. E. Eisenhour of the Riverbank Laboratory (founded

(1) Ann. Otol. Rhin. & Laryng., September, 1929.

by Col. Fayban), at Geneva, Illinios, obtained a magnesium alloy consisting of 95.6 per cent magnesium, one of the lightest metals known (with a specific gravity of 1.7), 0.4 per cent manganese (specific gravity 8), and 4 per cent aluminum, the latter having a specific gravity of 2.7. This alloy, therefore, has a specific gravity of about 2.2; in other words, one-third that of steel, which is usually 7.7. The two great advantages of this alloy are that it is rust proof and very light in weight. After a time this alloy changes color but does not peel. When using the low pitched heavy steel forks, the fingers tire quite easily after making a few tests. With the magnesium alloy forks, this difficulty is eliminated. A complete range of forks extending from C2 (16 double vibrations) to a C5 (4096 double vibrations) has been perfected by Mr. Eisenhour. The price of these forks is about 25 per cent less than the Edelmann series. With ordinary careful manipulation, these forks do not seem to break or become damaged any more easily than do the steel ones. Thus:

1. An alloy consisting of 95.6 per cent magnesium, 0.4 per cent manganese and 4 per cent aluminum serves very well for the manufacture of a complete tuning fork series, from C2 (16 double vibrations) to C5 (4096 double vibrations).
2. Magnesium alloy forks seem in actual practice to be no more brittle or liable to breakage than the steel forks, when properly handled.
3. These new forks are very light in weight so that they can be used for long periods of time without tiring the fingers.
4. The price of these forks manufactured in this country is about 25 per cent less than that of the best imported German forks.
5. Magnesium compound forks are rust proof, and therefore do not change their pitch on exposure to moisture or to manipulation with the hands.
6. The highest pitched C5 (4096 double vibrations)

magnesium fork does not vibrate long enough for all purposes, but the other forks of the series when in actual practice serve very well both in testing air and bone conduction.

7. When provided with the "constant" of damping, these forks as well as steel forks can be used to obtain the same curve and the loss of hearing, figured in sensation units, as is done with the audiometer.

A Simple Method for Exposing Malingering in Unilateral Deafness. B. M. Becker[2] proposes a new and simple method for exposing malingering in unilateral deafness.

A rubber tube about 4 feet (122 cm.) in length, equipped with an olive-shaped ear tip at each end (such as the auscultation tube for catheterization of the eustachian tube), and a fairly loud-ticking watch are the only requisites for the test.

The principle underlying this test depends on the following facts: When a person has normal hearing, if the ear tips of the tube are inserted rather snugly in the ears, so as to exclude foreign sounds, and a watch is pressed against the tube at a point equidistant from the ears, he will hear the ticking equally loud in both ears. He hears the sound binaurally and cannot lateralize it. As the watch is moved away from the middle of the tube, receding from one ear and approaching the other, he will, if the watch is moved only a little distance at a time, observe the change in the position of the sound. The sound will become rather pronounced in the ear toward which the watch is moved; in other words, it will tend to become lateralized. After a certain point up the tube is reached the sound will be definitely lateralized in the ear nearer the watch. Hearing at this time is distinctly monaural. The intensity of the sound in one ear will completely mask the sound in the other. The distance one must move the watch up the tube to obtain this result depends on the acuteness of the sub-

(2) Arch. Otolaryng., April 1929.

ject's hearing. In some people, if the watch is moved about 1 inch (2.5 cm.) from the center, the distance will be sufficient to enable them to lateralize the sound.

Both tips are inserted rather tightly in the patient's ears. This is best done by insinuating the tips in place by a rotary screwlike motion, describing half an arc. The tube is dropped in back of the patient's head.

Example: Assume that the patient is actually deaf or feigns deafness in the right ear. As the watch is placed nearer to the right ear of a patient who is deaf in that ear, it will not make any difference; the sound will be carried by tube to the left ear, and on being questioned concerning it, the patient will frankly state that he hears the watch tick in the left ear. In the malingerer, however, the placing of the watch nearer the right ear excludes the sound from the left, so that on questioning he is at a loss what answer to make.

Of course, he hears the sound in the right ear, and to questions put to him he may give one of two answers, aside from the fact that the examiner will observe his hesitancy and uncertainty of manner.

He will deny outright that he hears anything, in which event he will be exposed, for if his right ear is really deaf he would perceive the sound in the left ear. If he is a clever, practiced malingerer he will state that he hears a sound in the left ear, in which event the examiner pinches the tube so as to obliterate completely its lumen, thereby excluding the possibility of any sound reaching the left ear through the tube. If he still maintains that he hears the sound in the left ear, he is again exposed.

The tube near the normal ear may be compressed by means of a screw clamp before the test is begun. The same question is put to the patient. If he hears the sound in the left ear, he is exposed. If he does not hear any sound, the examiner gradually opens the clamp; then if he still maintains that he does not hear any sound, he again betrays himself.

This test may be made with any ticking instrument, and the tubes may be varied in length according to the loudness of the instrument.

[In the absence of a loud ticking watch an ordinary acumeter will answer the purpose. Before feeling qualified to express a positive opinion regarding malingering the physician should make several experiments (1) with normal ears to determine the normal reaction; (2) with those who are partially deaf but worse in one ear; (3) with those who are totally deaf in one ear and are normal or are partially deaf in the other.—Ed.]

The External Ear

Plastic Surgery of the Ear. According to C. D. Lockwood[3], congenital deformities may vary from entire absence of the ear to partially defective organs. The ears may be too large, the so-called "donkey ears" or "sail ears" or they may be too small. Large ears often prove a distressing deformity and subject their owner to humiliating ridicule.

The most difficult feat in plastic surgery is reconstruction of the congenitally absent ear. In the most advanced cases the auditory canal is usually lacking and it is impossible to form a canal. *X*-ray films will enable one to determine the presence or absence of the internal structures of the ear. Should these be lacking, the most that can be hoped for is the formation of an external ear which will simulate a normal one. If only the lobe of the ear is present, as in the author's case, the ear must be reconstructed from the scalp above and behind the ear and stiffened by transplanted cartilage. Cartilage grows readily if embedded in the connective tissue layers of the skin. Cartilage may be transplanted from a rib, from the opposite ear, or from the remnants of cartilage above the meatus of the deformed

(3) Surg. Gynec. Obst., September, 1929.

ear. The auricle is formed of flaps which are freed from the scalp by means of a butterfly incision and are folded upon themselves where they are sutured together with their raw surfaces in contact. Rigidity is secured by transplanted cartilage.

The incision first suggested by Szymanowski many years ago is useful in forming an auricle. Several operations are necessary, extending over a period of 2 or 3 years. The final results are often surprisingly good.

In case of total ablation of the external ear it is possible to transplant an entire ear from one person to another by using the back of the hand as an intermediary host for the grafted organ. Fitch has reported a case in which a young man had his ear completely severed from his head. He immediately picked it up and hastened to the doctor's office where it was cleansed and sutured in place. It healed perfectly. This would suggest the possibility of using the ear of a person recently dead as a graft.

Prominent or donkey ears are not uncommon; they constitute an actual deformity and are due to a change in the angle at which the ear joins the head. This leads to a bending forward of the auricle. In such ears the antihelix is undeveloped or lacking. The ridges which form the eminences and depressions of the external ear are, as pointed out by Luckett, due to fluting or folding of the cartilage. This deformity can be corrected by the removal of a crescentic segment of skin and cartilage from the posterior aspect of the ear. The cartilage is then sutured separately from the skin, the sutures being passed in Lembert fashion from one side to the other. Where these are tied the cartilage is rolled forward, thus producing a ridge on the anterior surface corresponding to the antihelix. Marked inequalities in the ears can be corrected by the removal of a portion of one ear through a V-shaped incision. The excised portion can be transplanted to the smaller ear if the disparity is great.

The largest field for plastic surgery of the ear is in traumatic cases. The ear may be partially destroyed by malignant disease, by syphilitic ulceration, or by trauma. The auricle of the ear is most often destroyed. Two such cases are illustrated. One of these was due to a friction burn of the scalp and upper third of the ear by a rapidly revolving motorcycle wheel. This ear was reconstructed by the removal of a V-shaped piece

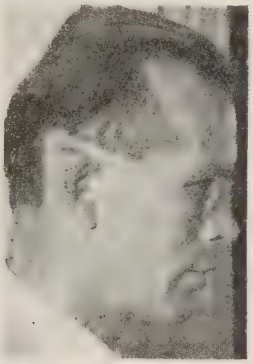


Fig. 44.

from the under and inner surfaces of the auricle and suture of the denuded edges. The ear was reduced in size but its contour was excellent.

In another case a man had the upper third of his ear torn off in an automobile accident. (Figs. 44 and 45). The problem presented was to secure sufficient tissue to restore the auricle and render it rigid. The tube graft which came into use during the World War lends itself to the restoration of such defects. The entire operation can be done under local anesthesia. The graft is first prepared from the non-hairy portion of the neck; two parallel incisions down to the fascia are made. The bridge of skin between these incisions is dissected up, folded upon itself and sutured. Particles of cartilage are taken from the tenth rib and embedded in the con-

nective tissue of the graft. The skin is sutured beneath the graft. If tension is too great the edges may be undercut. At the end of 10 days the tube is severed at its lower end; its edges separated and accurately sutured with horsehair to the split and freshened skin of the ear. Ten days later the upper pedicle is divided and sutured in a similar manner to the posterior surface of the split auricle.

Furunculosis of the External Auditory Canal. Furuncles are broadly divided by L. R. Effler[4] into: (*a*)

Fig. 45.

Idiopathic. The patient is usually physically below par. This is by no means always the case but the bona fide idiopathic furuncle is most frequently found in tired, overworked, nervous and debilitated subjects. This type is found only in adults. It may or may not be associated with general furunculosis.

(*b*) *Traumatic.* This is by far the commoner type. It must include those furuncles that are caused by efforts at cleaning or scratching the ear canal with tooth-picks, matches, hair-pins, ear-spuds, etc.; the furuncles resulting from the use of all medicines in the ear; the

(4) Ohio State M. J., July, 1929.

furuncles following in the course of suppurative otitis media or eczema, fungus infections, and other diffuse inflammations of the external ear canal; and the furuncles coming in the wake of sea-bathing or fresh water bathing. In a word, it includes all mechanical causes acting locally.

Treatment is both therapeutic directed against the present attack, and prophylactic directed against recurrences.

(1) *Therapeutic:* (a) Heat is a great alleviative. It may be applied by means of the hot water bag, the hot pad, or the hot douche. Poultices are not in order. A popular remedy consists in the instillation of warm drops of glycerin or sweet oil and laudanum. Anything warm may bring momentary relief. This is the reason why such homely remedies, as blowing smoke into the ear or breathing into the ear, have become popular. The warm vapor of the breath is responsible. Such remedies have all been known to give some analgesia: sometimes sufficient to permit a patient to drop off to sleep.

(b) When possible, the insertion of a small wick of gauze along the length of the canal permits more continuous application of soothing medications. This is in the nature of a wet dressing. Spirits of boric or iodin in glycerin or aluminium acetate, etc., may be used to keep the gauze saturated. From three to five drops are instilled every two hours. This method proves at times a very satisfactory reliever of pain and swelling.

(c) Incision and drainage is the sine qua non when all the other means fail. In the face of exquisite pain during the most careful examination, it is apparent that a great deal more care and solicitude must be given to the incision. Some stolid and stoical patients will scoff at the thought of an anesthetic. But most patients are so wrought up after several days and nights of unceasing pain that an incision without an anesthetic is like so

much torture. Local anesthetics are almost useless. A whiff of ether or gas or ethyl chlorid, whenever possible, is both merciful and desirable. It is best first to probe for the most tender point or the point of fluctuation. If superficial, the incision is made simply through the swelling; if deep, it must be continuous down through the perichondrium. In some severe cases, where the canal is completely occluded by swelling, parallel incisions of this kind may be made to advantage around the whole lumen. They radiate from the latter like the spokes of a wheel from the hub. They may be aptly called the "wheel-spoke incisions."

(2) *Prophylactic:* (a) Constitutional treatment must be inaugurated in many cases where the patient is debilitated. This is true especially of the idiopathic type. Otherwise, there will be repeated attacks at intervals of these same furuncles. Any good tonic consisting of iron, arsenic, strychnin, etc., coupled with fresh air, good food and plenty of fluids may suffice. The furunculosis vaccine here has its best "raison d'etre".

(b) The local condition of the canal wall must also receive its share of attention. When the lining is dry and scaly, there is usually a tendency to itching. The chain is broken by stopping the itching. Several drops of olive oil or albolene dropped daily into the canal will keep it moist and free from itching. The same purpose will be better served by the innunction of a mild carbolic ointment or a cresatin ointment in a zinc oxid base.

When the canal is oily from a seborrheic tendency, the use of a stimulating ointment gently massaged into the canal daily is of benefit. This can be done by means of a soft cotton swab impregnated with yellow oxid of mercury ointment, balsam of peru, icthyol, iodex, or any similar stimulating preparation. In this type, *x*-ray therapy may be of benefit. It is modeled along the same lines as the *x*-ray treatment for acne. The *x*-ray destroys some of the sebaceous glands and thereby limits the excessive seborrheal secretion. The over-use of the

x-ray, however, may destroy all these glands and substitute a dry and scaly canal. The latter replaces merely one evil with another.

Topography and Physiology of the Cutaneous Superficial Vessels of the Drum Membrane: Observations on the Living Man. E. Luescher[5] recently described a microscope for the ear which allows observation on the living man with a magnification of from 10 to 50 times. Vessels with a diameter of 10 microns can be seen. As a rule, an enlargement of 20 times was used; under certain circumstances, also a magnification of from 10 or 40 times. About 100 membranes were studied.

1. The topography of the superficial vessels and of the circulation of the blood on the living man can be studied with this microscope.

2. The cutis of the membrane of the drum, directly under the epithelium, contains an extensive connected meshwork of capillaries and veins, in the three dimensions, which covers the membrane in a varying arrangement and thickness. At the border, it is connected with the superficial plexus of the outer canal of the ear.

3. In spite of the various possibilities of the outflow, a certain rule exists. From the middle portion of the pars tensa, the blood goes to the umbo and then along the handle of the hammer to the upper wall of the canal over the stripe of cutis. The two outer thirds send their blood toward the periphery. The pars flaccida has an irregular current of its own. The afflux of the blood takes place in the deeper layers and is not visible normally. The kind and velocity of the blood current shows great variations in the whole and in its details, so that there does not exist a condition which can be considered to be normal.

4. The superficial net of vessels is divided into three parts, anatomically and functionally: (1) the central net of the pars tensa, (2) the peripheral net of the pars

(5) Ztschr. f. Hals-, Nasen-u. Ohrenh., June 16, 1928.

tensa and (3) the vessel net of the pars flaccida Shrapnelli.

5. The membrane of the drum is an apt object to determine the capillary pressure. It is 60 mm. of water in the average (from between 32 to 94 mm.). In some larger vessels (about 40 microns), the average is 94 mm. (from between 56 to 136 mm.). The first values are the lowest observed in man.

6. Normally, most of the vessels of the membrane are in a condition of tonic contraction, and they are closed to the blood current so that the normal blood current is confined to a few vessels, whereas this blood current is broad when dilated to its maximum. When dilated maximally, the current reaches about 20 times its normal size, and the volume velocity is from 100 to 200 times its normal velocity.

The Window Operation for Hematoma Auris and Perichondritis, with Effusion. This procedure reported by R. C. Howard[6], consists of removing a piece of tissue consisting of perichondrium and a full thickness of skin by means of a punch and thus producing a window with prompt evacuation of contents and free drainage.

The size and number of the fenestrations will depend on the extent and character of the swelling. If obviously infected, showing a tendency to spread and of considerable size, a number of windows should be made and placed to give the best drainage with the lowest visibility of the scar kept in mind. The window will stay open about three weeks and this is usually sufficiently long to prevent backing up or refilling.

If the tissues are not inflamed and the fluid not infected, a cotton-collodion cast is very satisfactory; but if there is any sign of active inflammation the cast should not be used and instead sterile dressings applied.

[Evacuation of the fluid and pressure to maintain contact between the cartilage and the perichondrium is the purpose of treatment. Plaster of Paris cast has

(6) Laryngoscope, September, 1929.

given good results. A window in the plaster should lead to the opening through the skin for drainage.—Ed.]

The Middle Ear

Congenital Arteriovenous Fistula in the Tympanum. F. Smith[7] reports a case of congenital arteriovenous fistula of the jugular bulb and the internal carotid artery in the right ear, characterized by deafness and a constant pounding noise in the right side of the head since childhood, total absence of the bony floor of the tympanum and the external canal, the presence in the tympanum and external canal of an occluding, pinkish-blue pulsating mass and, finally, spontaneous hemorrhage at the age of 24.

In this case, there was congenital anastomosis between the internal carotid artery and the jugular bulb, complete absence of the bony floor of the tympanum and external canal, partial absence of the anterior tympanic wall and spontaneous hemorrhage without infection.

In operating the aneurysmal sac was pushed through the dehiscence in the bony floor into the soft parts of the neck, and supported with an adhering layer of soft parts sufficiently thick to prevent further bleeding. With this in view, the original incision was reopened and the sac exposed. It was liberated from the tympanum by careful blunt dissection, and its surface scarified in several areas. Considerable debris, with the entire epithelial lining of the tympanum, was removed. A flap, 3/8 inch wide and 1¼ inches long (0.9 by 3.13 cm.), with its base posterior to the lobule of the ear, was taken from the side of the neck and transplanted along the floor of the canal over the dehiscence and in the middle ear. The flap was firmly held against the promontory of the middle ear and the floor of the canal with a mold of dental modeling compound.

(7) Arch. Otolaryng., July, 1929.

After four days the modeling compound was removed. The distal end of this flap which covered the promontory showed evidence of poor circulation with a tendency to necrosis. This condition became more marked, until eight days later when the entire flap was reelevated and its distal end amputated and replanted as previously described. The healing of this flap proceeded without further incident.

The patient has engaged in her ordinary normal occupation during the past three years and has no subjective symptoms. No change is demonstrable in the neck or in the heart borders.

The Open Eustachian Tube. L. K. Pitman[8] believes that the hypertrophied tonsil causes ear disease in a different way from that which is usually attributed to it. He states that a hypertrophied tonsil is a well known etiologic factor for impairment of the middle ear, which is usually ascribed to hyperemia of the surrounding tissue or to that of focal infection. In a review of the literature, the author has failed to find an embedded hypertrophied tonsil given as a cause for an open eustachian tube. He has found this to be so, on account of its anatomic position, for the inner extremity of the levator palati muscle is immediately above the dome of the tonsil. One can readily see that a high-domed hypertrophied tonsil, on account of its upward pressure, tends to elevate the levator palati muscle, which in turn pushes the alar cartilage backward, upward and inward, and causes the pharyngeal orifice of the tube to remain open.

A simple experiment will demonstrate this to be true. Examine a patent eustachian tube with a nasopharyngoscope and then remove the hypertrophied tonsil on the same side. Examine again the orifice of the tube, and it will be seen that it has tended to close. While the movement of the tube is being observed, place in the tonsillar fossae a sponge attached to a sponge holder.

(8) Arch. Otolaryng., May, 1929.

While the sponge is in situ, the tube is seen to be opened and when the sponge is removed the tube tends to close.

It would thus seem that hypertrophied tonsil may cause the eustachian tube to be constantly open.

Otitis After Packing of the Nose and Nasopharynx: Bacteriology and Clinic. According to T. German[9], the following measures in the nose and nasopharynx may cause acute inflammations of the middle ear: (1) improper irrigation and blowing of the nose; (2) cauterization of the nose; (3) operations in the nasopharynx —especially adenotomies, which may cause an injury to the tubal ostium or an inflammation of the wound; (4) packing of the nose and of the nasopharynx (after Bellocque) on account of hemorrhage, or prophylactically during operations. Not only mechanical pressure of the soft parts of the tubal ostium but also abnormal secretion, with decomposition of the secretion, are concerned, especially when the packing is left in situ for a long time (Stenger).

In the outpatient department of the largest ear clinic in Budapest, only 28 cases were observed from 1919 to 1928. Hartmann reported three cases in 1881. Some authors report the appearance fourteen hours after introduction of the packing (retronasally), whereas Goldberger reported the occurrence on the fifth day after removal of the packing. Most authors (Finder and others) permit the packing to be left in place for only twenty-four hours. In many instances, in spite of all precautions, a complication in the ear may set in. Otto Mayer claims that such a complication is more or less present in every case. He has observed a slight hyperemia of the drum membrane in every case. In such instances, the immediate removal of the packing prevents the development of an otitis. If swelling of the drum membrane accompanies the injection, the removal of the packing is imperative, in Mayer's opinion. The anterior

(9) Ztschr. f. Hals-, Nasen-u. Ohrenh., Sept. 5, 1928.

packing of the nose may cause trouble by way of the lymph vessels (von Lenart, Most).

The occurrence of tonsillitis is easily explained by the paths of the lymph vessels. The author reports 28 cases in great detail. Retronasal packing was done in six instances. In one patient, a spontaneous perforation of both drum membranes occurred during the first twenty-four hours. If one side of the nose was packed (six cases), the ear on the same side became diseased. In half the cases of retronasal packing, unilateral, in the other half, bilateral otitis occurred. Of the 28 patients, 23 were cured without an operation.

The bacteriologic observations were as follows. Streptococcus hemolyticus, 8 cases; Streptococcus hemolyticus and pneumococcus, 9 cases; Pneumococcus, 3 cases; Streptococcus (pneumococcus) mucosus, 2 cases; other organisms, single cases.

In a bilateral infection, pus in the right ear contained Streptococcus hemolyticus and Streptococcus pseudodiphthericus, whereas on the left side Pneumococcus was present. The microbes found in otitis following packing are also normally in the throat, the tube and the nose, especially in the nose and in the throat of patients with hypertrophies, deformed septums, accessory sinus diseases, adenoids, etc. In order to became pathogenic, these microbes must become more virulent. This increase in virulence is greatly favored by packing, especially if it is left in place for a long time, and, most frequently, if it is repeated (Marshik), whereby more favorable conditions are created for the microbes. Clinical symptoms in the form of local inflammatory conditions and, perhaps, rise in temperature bear out this statement. Caldera and Santi proved the injurious influence of packing in experiments on animals, especially when gauze which was not antiseptic was used. This effect was especially evident in an increase of the virulence of old microbes. New microbes could be observed only after packing with sterile gauze.

The relative benignity of the otitis caused by packing may be explained by the circumstance that the system can more easily deal with effects of its own microbes, on account of a certain degree of immunity.

Otitis Media and Its Relation to Gastro-Enteritis. A study of gastro-enteritis in infants under 2 years of age and its relation to otitis media has been carried out over a period of two years by A. Graeme Mitchell, Merrick F. McCarthy, John W. Leichliter and Frank Seinsheimer[1]. Collaborating in this study were otologists, bacteriologists and pediatricians. There are several actual and contributory causes of gastro-enteritis. No one cause seems sufficient in itself to explain in an etiological way all cases that are ordinarily classified as gastro-enteritis. The majority of infants in this study suffering from gastro-enteritis did not have middle ear infection preceding the gastro-intestinal symptoms.

In comparing the seasonal incidence of gastro-enteritis and of otitis media and respiratory infections in general, it seemed evident that gastro-enteritis was a condition occurring at a season of the year (July, August, September and October) when otitis media was not so prevalent. However, a surprising number of cases of otitis media occurred during these months in infants. The majority of infants suffering from otitis media and brought for admission to the hospital primarily for that condition did not have, and did not develop, gastro-enteritis. In those cases in which otitis media occurs in infants suffering from gastro-enteritis, the authors have suggested that there might be four possible explanations: (a) The gastro-enteritis might be caused by middle ear infection; (b) the middle ear infection might be caused by the gastro-enteritis; (c) gastro-enteritis and middle ear infection might result from the same cause, or (d) gastro-enteritis and middle ear infection might be independent but co-existing infections.

While they do not wish to make a definite statement

(1) J. A. M. A., March 23, 1929.

concerning this matter, they have brought out certain clinical studies, bacterial investigations and theoretical considerations which would indicate that no one of these situations mentioned is the only possible explanation in every case. The authors believe that, when mastoid antrotomy is properly performed on infants who have severe gastro-enteritis, the factor of operation does not materially increase the mortality risk.

Upper Respiratory and Middle Ear Infections. The pathogenicity of the organisms isolated from 15 different middle ear infections in man was tested by J. H. Fischer[2] in rabbits by intranasal inoculations. The nasal passages of the rabbits were previously swabbed with a 50 per cent aqueous solution of phenol. Eleven of these rabbits died and in each case acute purulent paranasal sinusitis and acute otitis media were found. From these lesions, an organism similar to the type inoculated, was recovered in each instance. Acute pleuritis and empyema, lobular pneumonia, lung abscesses, acute pericarditis and septicemia were found as associated lesions in some of the rabbits. From these lesions, organisms similar to those inoculated intranasally, were recovered in each case. The experiments were controlled by two groups of rabbits, one group receiving culture only, intranasally, the other receiving phenol swabbing only and no culture. None of the rabbits of these two groups died. Some factor which lowers the resistance of the nasal mucosa is necessary for the production of upper respiratory and middle ear infections. In 12 untreated normal control rabbits no evidence of otitis media was found.

It is thought that the use of 50 per cent phenol as a means of reducing tissue resistance may prove of value in the experimental production of infection in animals.

Fifty acute middle ear infections in man were studied bacteriologically. Streptococcus hemolyticus was the most frequently found exciting organism while staphylo-

(2) J. Infect. Dis., January, 1929.

coccus and pneumococcus were next in frequency.

Evidence here presented indicates that otitis media is not blood-borne but takes place by direct extension from an upper respiratory infection.

Conservative Treatment of Otitis Media. C. B. Summers[3], from a pediatric standpoint, states that while he sees quite a number of red ear drums, he has never made it a practice to lance them; instead he directs his therapy to the posterior nares, and in that way directs medication to the primary focus. One thing the author admits is that he finds it quite a difficult matter to be positive of ear findings and especially is this true with very young infants. Nevertheless, regardless of whether he gets a clear view of the drum or not his therapy is directed to the nose and not the ear. He does lance ear drums or have them lanced by a competent ear man, but the occasions are infrequent. In other words otitis media purulenta and mastoid involvement in his experience are rare occurrences. The author feels as though a more conservative treatment of otitis will be more beneficial for the little patients. He believes that too much surgery is being done on these infants without justification. A good surgeon is one who has surgical judgment, *i.e.*, the one who knows the proper time to operate. To lance the drum merely because it has lost the natural lustre or because it is reddened is poor surgical judgment and is inviting trouble.

Otitis Media and Allergy. E. R. Lewis* has encountered six cases of acute otitis media which he thinks from their history strongly suggest the allergic nature of the inflammatory reaction.

Case No. 1: Male, age 45, son of allergic (asthmatic) mother, father of an allergic (asthmatic) son; attended dinner party where, shortly after being seated at the table, he began to notice an odd sensation in left ear.

(3) J. Kansas M. Soc., May, 1929.
(*) Ann. Otol., Rhin. & Laryng., March, 1929.

This quickly became an increasing earache, throbbing and obtunding hearing, and before the close of the meal spontaneous perforation with profuse serous discharge had taken place. Examination prior to this incident had revealed intact tympanic membrane and quiescent tympanic and eustachian structures. Temperature, pulse and respiration were normal, and upper respiratory tract showed no symptoms or evidence of inflammation that evening or the following days. The serous discharge was profuse for the first fifteen hours; the patient was kept in bed, given a high fluid intake with alkalizing citrates and bicarbonates. In thirty-two hours the discharge ceased and eustachian inflation showed perforation closed the next day.

Case No. 2: Female, age 42, able to give very little information concerning health of progenitors, while shopping one morning experienced acute right earache, without premonitory symptoms of any kind. Examination showed tympanic membrane swollen and pink, and spontaneous perforation occurred during otoscopic inspection, about ninety minutes after onset of symptoms, with abundant clear serous discharge. She was put to bed at once; temperature, pulse and white cell count were normal; cochlear examination showed high degree of sound conduction impairment; general upper respiratory examination discovered no evidence of irritation except closure of right eustachian tube. Heat applied to right ear, high alkaline fluid intake and rest in bed for thirty-six hours resulted in abrupt cessation of discharge, subsidence of tympanic swelling, opening of eustachian tube and closure of perforation within thirty-six hours of cessation of serous discharge.

Cotton Dental Rolls for Ear Drains. M. C. Fox[4] believes that dry drainage for acute suppuration of the middle ear is based on sound fundamental surgical principles. The greatest number of authorities are in favor of some form of dry drainage for acute suppura-

(4) Northwest. Med., April, 1929.

tion of the middle ear. The No. 1 inch and a half cotton dental rolls provide the best, as well as the most convenient form of this drainage. The roll is grasped endwise between the thumb and forefinger of the left hand, and with sharp, long blade scissors the roll is cut diagonally across, the cut beginning not quite at the lower end of the roll and ending not quite at the upper end.

The author instructs the mother to hold the roll as

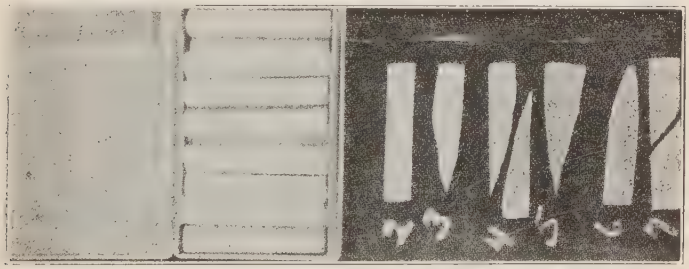


Fig. 46—No. 88 powder box filled with drains, with instructions for their use in the cover. 2. Natural size roll before it is cut. 3. Showing cut side of roll. 4. Showing two halves of a properly cut roll. 5 A roll cut too near the end which allows it to flatten. 6. A roll cut too near one end, making the drain too long and spoiling the other half by flattening. 7. Result of careless cutting. Such drains cannot reach the drum head.

above described, because the fingers do not come in contact with the part that enters the ear. The sharp, long blade scissors prevents the roll from being crushed in the act of cutting it. The beginning of the cut should be a little distance from the lower end and ending a short distance from the upper end so that the drain will not flatten out when being placed in the ear.

These drains come in boxes of 500, but the general stock rolls are not very satisfactory, for they are not uniform in either size or firmness. By taking 5,000 the author is able to get from Johnson and Johnson a specially selected lot of rolls, which are very satisfactory, at a slight increase in price.

As shown in Figure 46, these rolls are put up

in No. 88 powder boxes which hold 25, and are given to the patient to use at home. It has been found that this box is about the right size because, first, the patient takes better care of the rolls, if he thinks he might run short before returning to the doctor's office: second, the patient should be seen by the doctor when he has used 25 rolls or 50 drains. If the ear is draining so freely that it required 50 drains a day, such a patient should be seen by the doctor every day. If 50 drains will last him two days, he need not be seen oftener than every two days. The number of drains required is a very accurate criterion of the progress of the case.

In conclusion the author states that more ear-drums should be opened early and more care taken of the ear after the drum is opened. Where there is pulsating pus, there is also insufficient drainage. The theory of normal pulsating pus in acute suppuration of the middle ear should take its place with that of laudable pus.

Streptococcus Mucosus Otitis. I. R. Vaile[5] reports that the condition of *S. mucosus otitis* is very common, as judged by the number of cases seen at the Neumann clinic. It is less common in infants than in adults. It is characterized by a very much shortened stage, followed by a symptomless period. The patient is fairly comfortable, and complains only of a dull feeling in his affected ear. Examination shows a very slight rise in temperature or no rise at all; absence of pain or tenderness on pressure over the mastoid region. The drum membrane has a marked tendency to close after paracentesis. There is very scant discharge. The drum membrane is gray and very much thickened. There is a decided tendency towards intracranial complications. Operative interference is indicated during the latent symptomless period.

Acute Suppuration of the Temporal Bone. This case reported by E. W. Hagens[6] is of interest because: (a)

(5) Canadian M. A. J., February, 1929.
(6) Arch. Otolaryng., July, 1929.

the patient, with no previous aural history, developed abscess of the brain and meningitis sixteen days after the onset of acute otitis media; (b) autopsy was performed on the thirtieth day from the time of onset; and (c) microscopic examination was made of the diseased temporal bone.

The course of the disease was as follows: On July 2, otitis began; five days later, there was sinus thrombosis; on July 17, the first symptoms were noted of an abscess

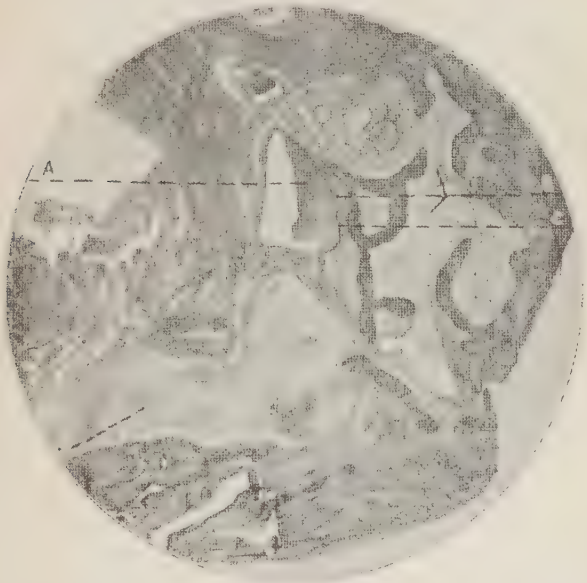


Fig. 47—Mastoid cells. A indicates pus lying free in the pneumatic spaces; C, epithelium raised up from the bone by development of a thick epithelial layer of connective tissue (B).

of the temporal lobe, which probably had begun some time previously. The sinus was opened during the second operation, and blood came out in a stream from both ends. Nevertheless, a large thrombosis developed in the sinus. When the abscess in the brain was operated on, the ventricular fistulas which must have been

present on July 18, were held back. In spite of this, the patient died from sinus thrombosis.

Autopsy showed a subdural abscess, an obturating and adhering thrombosis in the sigmoid and inferior petrosal

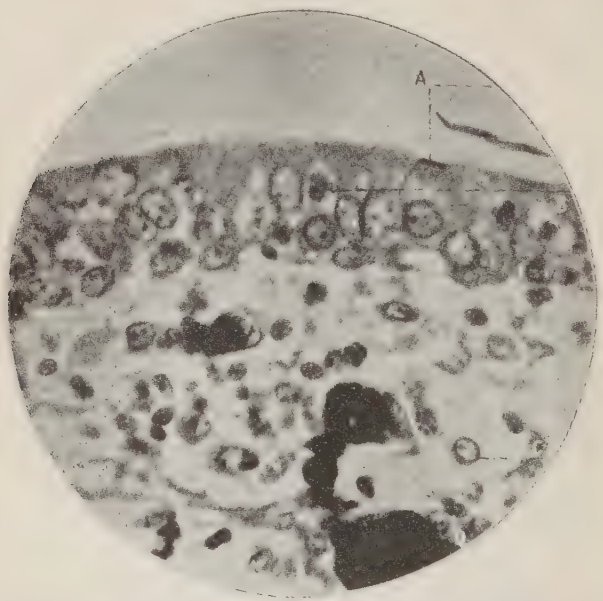


Fig. 48—Epithelium showing polymorphonuclear leukocyte (B) going through the epithelium. A indicates basal bodies with cilia; C, lymphocyte, and D, blood vessel in the thickened subepithelium.

sinuses, meningitis, diffuse encephalitis and an abscess of the right temporal lobe.

Microscopic examination of the temporal bone by the author showed the mastoid spaces practically filled with extensively developed connective tissue and pus (Fig. 47). In places the epithelial mucous membrane lining the spaces had been pushed into the lumen for a considerable distance by the enormous development of the subepithelial layer. The latter was vascular and contained numerous lymphocytes and some plasma cells. Pus and blood were in contact with bare bone in one of the pneu-

matic spaces. The bone tissue, itself, appeared to be normal. From an examination of the sections it was impossible to demonstrate definite infection of marrow spaces or that the infection spread along vascular channels. The spaces which were infected might all be pneumatic cells.

Of the middle ear structures the ossicles were com-

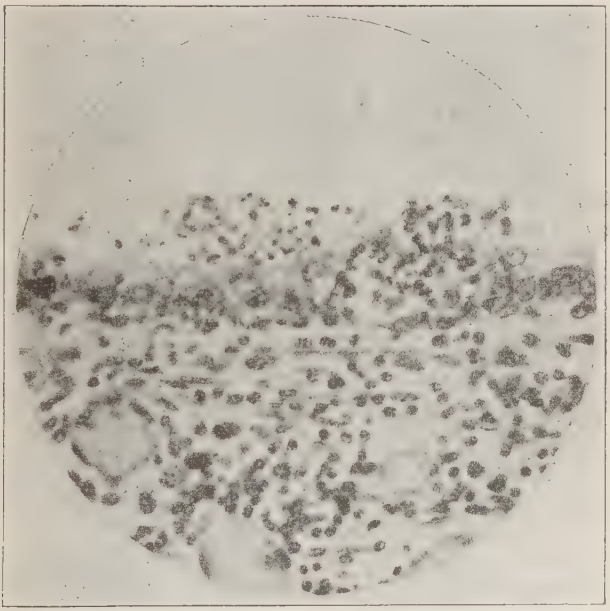


Fig. 49—Abscess in epithelium with numerous polymorphonuclear leukocytes in the abscess cavity and extruded into the lumen of the cavum tympani.

pletely surrounded by infected connective tissue and free pus and blood. A special study of the swollen mucosa of the tympanic cavity revealed the changes occurring during acute otitis media and which are so rarely demonstrated microscopically. Figure 48 shows a polymorphonuclear leukocyte passing through the epithelium, while Figure 49 illustrates an abscess of the epithelial layer.

Lower sections showed a connective tissue prolongation from the cavum tympani, which was in fistulous contact with the vestibule at the site of the round window. The seventh and eighth nerves were intact and the inner ear was not infected.

Facial Paralysis Associated with Acute Otitis Media. S. M. Morwitz[7] reports three cases of facial paralysis associated with acute otitis media.

Clinically, facial paralysis is divided into a central and peripheral variety. The central type includes the paralyses which are produced by a lesion of the neurones and axones above the facial nucleus in the pons. The peripheral are those which are due to a lesion of the nucleus or of the nerve distal to it.

Most facial paralyses are of peripheral origin. The seven cases reported by Danelius were all of peripheral variety. Those of central origin occur chiefly through intracranial complications of otogenic diseases.

The mode of involvement of the facial nerve in acute otitis media cannot be determined with certainty, but may be calculated from a study of their anatomic relationship. The outer wall of the fallopian canal containing the facial nerve as it crosses the inner wall of the middle ear cavity is often almost membranous in thinness and sometimes actually has an hiatus in its bony continuity. There are other openings in the bony wall between the canal and the tympanic cavity, such as those for the passage of the chorda tympanic nerve, the branch from the facial to the stapedius muscle, and the tympanic branch of the stylomastoid artery. It is thought that these offer avenues for the spread of the infection.

Paralysis of the facial nerve is brought about either by direct involvement of the nerve and its sheath, or by the pressure of the exudate within the fallopian aqueduct, or by pressure from the tympanum. Ulceration and caries of the wall may take place even in the acute stage.

(7) J. Otol. Rhin. & Laryng., December, 1928.

The author summarizes his report as follows:

1. Facial paralysis is an uncommon occurrence with otitis media.

2. Available statistics record less than 1 per cent of all otitic suppurations accompanied with facial paresis.

3. Most of the facial palsies are of peripheral origin.

4. Anatomicopathologic explanation of the facial nerve involvement assumes compressive factors as congestion, hemorrhage and mild inflammatory exudates within or without the nerve sheath.

5. Relatively few actual cases of facial paralysis with acute otitis media are recorded in the literature.

6. The prognosis in this type of case is very good, although recovery of the paralysis may be extremely slow.

7. The treatment of facial paralysis with acute otitis media is primarily that of the ear condition per se.

8. Physiotherapy (galvanism) should be applied in the prolonged facial paresis cases.

Acute Otitis Media with Facial Paralysis. J. R. Peabody[8] believes that on account of its anatomical peculiarity the seventh nerve is more often involved than any other cranial nerve.

About 75 per cent of all cases of facial paralysis are rheumatic or toxic in origin. Nearly all cases are of the peripheral variety.

Congestion, hemorrhage or pressure of slight inflammatory exudates within or without a nerve sheath in an unyielding bony canal could produce functional disturbances. It is possible for a facial paralysis to be caused by a simple acute otitis media without mastoiditis, but very few cases have been reported in literature.

The paralysis comes on suddenly and nearly always affects all the facial muscles supplied by the facial nerve. The treatment of facial paralysis caused by or associated with acute otitis calls for conservatism and recovery takes place quickly after free drainage of the middle

(8) Kentucky M. J., September, 1929.

ear abscess. Electrical treatment of the paralyzed muscles should be carried out only in the hands of experts and in protracted cases, but it is not necessary in the mild forms.

Homolateral and Heterolateral Paralysis of the Abducens in the Course of Otitis. Vernieuwe[9] is of the opinion that the term "syndrome of Gradenigo" is badly abused. Gradenigo described the condition as an acute otitis with continuous pain in the occipitoparietal region with paralysis of the abducens nerve, usually homolateral. However, heterolateral paralysis has been observed. In dealing with the pathogenesis of this condition, the author considers three causes, anatomic, reflex and toxic.

The homolateral paralysis can easily be explained by the proximity of the sixth nerve to the apex of the bone. Osteitis with or without necrosis, a circumscribed meningitis or leptomeningitis could easily cause a disturbance of the external rectus. Such an osteitis could also cause an intracranial hypertension that might affect the sixth nerve on the side of the lesion.

The anatomic theory, however, cannot account for the heterolateral involvement. The author does not accept the reflex theory as plausible because the labyrinth is not often affected in these cases; and if it is affected the labyrinthitis is recognized as such, and the paralysis of the sixth nerve can be attributed to the subsequent meningitis.

The toxic theory of the heterolateral paralysis of the sixth nerve seems more acceptable. The author cites the cases of sciatica and paralysis of the sixth nerve following spinal anesthesia to bear out his arguments. He believes that the heterolateral paralysis is a neuritis due to toxemia, and advances the theory that the nerve on the side of the inflammation, on account of the proximity of the osteitis, becomes more or less immune to

(9) Rev. de laryng., Feb. 29, 1928.

the toxemia, and the opposite nerve suffers the burden of the assault.

Abducens Paralysis in the Course of Otitis Media. Seven cases of paralysis of the abducens nerve in the course of otitis media are reported by A. A. Boonacker and E. Huizinga[1]. The mastoid was operated on in four instances. Twice the mastoid was opened on account of the paralysis but was found to have had no relation surgically to the paralysis of the abducens nerve. In the other two cases, the mastoid was operated on because of other indications. Two patients had only catarrhal otitis media, and they recovered spontaneously from both the paralysis and the otitis.

In their review of the literature the authors state that influenzal and grippal infections play an important rôle in the production of the paralysis. Influenza is known to be productive of polyneuritis. In the cases observed, some had an accompanying trigeminal and others a peroneus neuritis.

They take exception to the theory that the involvement is produced by an extension of the infection through the point of the bone. In two cases lumbar puncture was performed with a negative result. They did not note cochlear or vestibular involvement in any of their cases. They also believe that the fact that the paralysis usually occurred on the side of the involved ear can be explained on the ground that in grippal and influenzal infections the nerves situated in the vicinity of the infected cavity are early involved.

Most of the paralyses of the abductor nerve occurred in acute infections, and they are more usual in adults. Seldom does a chronic infection of the ears produce this complication.

The authors conclude that the occurrence of paralysis of the abductor nerve of the eye in the course of acute otitis media is not a serious complication and that early operation on the mastoid is not indicated, as in a large

(1) Acta oto-laryng., 13: 65, 1928.

majority of these cases of paralysis recovery would be spontaneous.

Gradenigo's Syndrome. According to S. D. Greenfield[2] the advent of palsy of the sixth nerve, parietotemporal or supra-orbital pain occurring in connection with an acute suppurative otitis media has long been a well established clinical entity. According to the clinical manifestations, three groups of cases are described:

The first group includes patients who have an acute otitis infection, parietotemporal, supra-orbital or retrobulbar pain and a paresis of the sixth nerve. The majority of these patients recover spontaneously.

The second group includes patients who present all of the conditions mentioned, and in addition have involvement of the second, third and fourth nerves. Most of these patients recover.

The third group includes patients who present the symptoms of either of the previous groups, but in whom the condition has a fatal termination as a result of a diffuse leptomeningitis.

The pathologic process of the so-called Gradenigo's syndrome exists in the form of a circumscribed serous leptomeningitis, which originates from an involvement of the cells in the petrous pyramid. The infection gains access to this area through one or more of several routes.

In cases in which there are definite evidences of infection and necrosis of the mastoid, the petrous tip becomes involved as a result of direct extension of the suppurative process. This is more apt to occur when there is an unusual pneumatization into the apex of the petrous bone. The infection localizes here and produces an osteomyelitis of the tip of the bone. Extension to the overlying dura follows, with the subsequent development of a serous meningitis. Owing to edema of the adjacent tissues, pressure is exerted on the sixth nerve as it courses over the superior surface of the petrous tip. In a similar manner, there is an involvement of the

(2) Arch. Otolaryng., February, 1929.

second, third and fourth nerves. Owing to the proximity of the gasserian ganglion, which is located on the anterior surface of the bone, pressure on the ganglion is evidenced by the temporoparietal, supra-orbital or retrobulbar pain.

The Pathogenesis of Cholesteatoma. Le Roy M. Polvogt[3] states that suppurations of the middle ear are the most common diseases with which otologists come in contact. The most important of these are the chronic types associated with the formation of cholesteatoma. It is commonly thought that a relatively long period elapses between the initial suppuration and the formation of cholesteatoma.

It is known that cholesteatoma begins as an epidermization of the lining of the cavity of the middle ear. This process may take place by one of several different methods. Epidermization of the middle ear begins as an ingrowth of squamous epithelium from the external canal, following destruction of the epithelium of the middle ear and marginal perforation or total destruction of the drum. This destruction of the epithelium and drum of the middle ear may be a result of either an acute exanthematous otitis or of a chronic disease such as tuberculous otitis. The first histologic proofs of this were given by Bezold and by Habermann.

Bezold, moreover, called attention to those cases in which after long retraction of the drum Shrapnell's membrane, which is lacking in a fibrous layer, occasionally tears. From this tear, epidermization takes place. The retraction of the pars flaccida in these cases is due to chronic obstruction of the eustachian tubes, and the condition is usually bilateral.

In addition to the foregoing observation of Bezold, Lange and Hellmann observed that the epidermis of the pars flaccida, under influence of chronic irritation due to eustachian catarrh, had a tendency to deep ingrowth. This ingrowth may push the mucous membrane

(3) Arch. Laryng., July, 1929.

aside or force it from its base and form epidermic scales.

Although the majority of cholesteatomas may be explained by one or the other of the foregoing two methods, there are cases in which the assumption of metaplasia must be accredited with the appearance of squamous epithelium in the middle ear. In his study of this question, Ulrich found a large percentage of cases in which the history of the patient revealed no distinct causal condition. The existence of tuberculosis of the middle ear was especially noticeable in these cases. He observed that 41.2 per cent of these cases of cholesteatoma were associated with tuberculosis. In the presence of active tuberculosis, there was healing of the ulceration by the formation of typical squamous epithelium.

The question of a congenital origin of cholesteatoma is always referred to. This source of origin is probable, but the proof must certainly be rare. Nager showed that of approximately 100,000 patients observed in Munich, Basel, and Zurich, congenital cholesteatoma was never found.

Polvogt reports this case of a child with intense otitis following scarlet fever. The right drum ruptured spontaneously on the sixth day of the disease. On the thirteenth day, the disease terminated fatally. Microscopic examination revealed a mild otitis in the left ear, whereas an ulcerative and necrotic otitis was present in the right ear. On closer observation there could be seen, even at this early period, a distinct ingrowth of squamous epithelium from the right external auditory canal.

This case gives a clear and distinct answer to the aforementioned question as to the time within which the formation of cholesteatoma begins. The patient died seven days after the rupture of the drum, and within that time it is shown that the squamous epithelium was

in active progress. The epidermization, or formation of cholesteatoma, began early as a healing tendency.

From the practical point of view, this case demonstrates the advisability of following the idea of Siebenmann; namely, that in such cases if operation is necessary, antrotomy is not sufficient, but the radical operation should be done.

Chronic Deafness. The progress of aural surgery in the treatment of middle ear suppuration, with its attendant labyrinthine, intravenous, and intracranial complications, has been so remarkable that it has perhaps obscured the claims upon the otologist of those who are only deaf. In this editorial[4] it is stated that the discussion held last week by the Section of Otology of the Royal Society of Medicine on the subject of chronic deafness had the merit of showing what has been done for the alleviation and cure of this disability, and of taking stock of the methods at present adopted for its prevention and treatment. There can be no doubt that the success of preventive measures—*e.g.*, the removal of adenoids in early life, or the prompt treatment of middle ear suppuration, which nowadays is only rarely allowed to become chronic—has received less credit than it deserves. While, however, there are substantially fewer deaf persons haunting the out-patient clinics and the consulting rooms of otologists, their number is still a standing reproach to modern aural surgery.

Without entering into a detailed classification of pathological types of deafness, it may be said briefly that changes in the middle ear, disease of the cochlea or of the auditory nerve, and that mysterious disorder otosclerosis, account for practically all cases. It has been contended that study of the pathology of deafness has resulted in nothing but a therapeutic nihilism, nearly everything that has been done for its practical relief having originated in mere empiricism. This state-

(4) Brit. M. J., May 11, 1929.

ment, while it is unduly sweeping, and certainly unjust to those who have scientifically studied the morbid anatomy of the ear, contains some truth, and accounts for the number and variety of the methods of treatment recommended. Their very number, admittedly the product of a commendable activity in the otological microcosm, is evidence of the inefficiency of each method individually.

It is conceded on all sides that the basic and well established treatment of chronic deafness is the removal of septic tonsils, whose presence is often overlooked, the drainage of any focus of infection in the nose, and inflation of the tympanum by the eustachian catheter or the method of Politzer. When these measures have failed, as they often do, the otologist still finds himself confronted with the maze of remedies which have been tried and discarded and then revived again, and also with some newer methods still on trial. Thus there are those who still employ inflations of vapor into the tympanum, massage, and ionization. Recently massive intravenous doses of colloidal iodin have been tried, but as they may well cause obliteration of veins the method is unlikely to come into general use. Diathermy has given benefit, and has been found to relieve the tinnitus aurium which is so often a distressing concomitant of deafness. Ultraviolet light has naturally been given a trial, and the apparatus of Zund-Bourguet is still in active use. Cathcart claimed that of 623 patients treated by this apparatus 396 (63 per cent) were improved, but it is impossible to say how many (and this is true of the claims made on behalf of most forms of treatment) were cases of functional deafness.

The hard of hearing become inattentive; if they do not listen they do not hear, and they develop an epiphenomenon, a functional deafness, "the malady of not marking."

The most satisfactory report came from Watson-Williams, who has found that some patients with otoscler-

osis, which has an ill-defined but generally accepted relation to calcium metabolism, are benefited, even cured, by extract of parathyroid gland in large doses. There is one form of treatment—namely, operation on the middle ear—which seems to have been abandoned definitely and permanently. This method has had a fair trial, but on the whole without good result. The difficulty of obtaining a sterile field of operation entails the risk of provoking a middle ear suppuration, with all the attendant consequences and possibilities, and little is now heard of stapedectomy and intratympanic tenotomies.

Behind all this, however, as Hastings observed, lies the fundamental difficulty of testing the hearing efficiently. It frequently happens that the patient is pleased with treatment, and says he hears better, although tests of hearing show no improvement. The opposite also is true: the patient may show an improvement to hearing tests without obtaining any subjective benefit. One may conclude that, although a great deal can be done for deafness and tinnitus even today, it is not likely that much advance will be achieved by methods founded on empiricism. There must first be developed more satisfactory methods of testing the power of hearing and estimating its changes, and new methods of treatment must be established on a rational pathological basis. It may be gratifying to produce a subjective increase of hearing and diminution of tinnitus, but this by itself should no longer satisfy the modern student of otology with a scientific training. The introduction of new and better methods of treatment will entail much laborious research, both clinical and pathological.

A Few Thoughts on Chronic Suppurative Otitis Media. A large number of cases considered simple are believed by G. W. White[5] to have mastoid involvement. An *x*-ray study should be made of all cases of chronic purulent otorrhea.

(5) Kentucky M. J., September, 1929.

It is believed that cases showing mastoid involvement should be classed separately and further study made. Tubercular cases rarely showed evidences of mastoid disease. No specific remedy has been found. Tried under similar conditions, the newer antiseptics have given little, if any, better results than the older remedies.

Diathermy, ionization and other electrical treatments are believed to be of value in many cases when given by experts who possess the proper equipment, but in the hands of novices may do irreparable damage. The value of light therapy alone appears to be very limited.

Skillful surgery still holds first place in removal of diseased tissues. Diseased mastoid cells should be removed during a period of quiescence.

Diagnostic and Therapeutic Value of Iodized Oil in Chronic Purulent Otitis Media and Chronic Mastoiditis. Since the use of iodized oil in cases in which it was proven that the oil globules penetrated to the uttermost residual cellular recesses of the mastoid cells, together with the surprising and satisfactory therapeutic influence of the iodin on the diseased deep structures, M. J. Mandelbaum[6] has used it in more than 20 cases of chronic otitis, associated with varying degrees of subacute and chronic mastoiditis or acute exacerbations of chronic mastoiditis, with considerable success.

The purpose of this article is to suggest to other colleagues the use of this medium in cases of a similar type, to have roentgen studies made of the injected mastoids before and after injection of iodized oil, and to report both their roentgen findings and therapeutic results.

In acute mastoiditis with distinct operative indications and in chronic cases with acute exacerbations calling for operative interference, iodized oil is not to be considered of any moment.

It has proven, however, that in several cases previously mastoidectomized, with recurrent attacks of mastoid pain and discharge, the presence of unremoved

(6) Laryngoscope, March, 1929.

mastoid cells can be visualized, and in these few cases, at least, that the use of the iodized oil has apparently brought about a temporary cessation of pain and discharge and complete relief of symptoms. With the affected ear uppermost, 1 cm. iodized oil is instilled into the ear and allowed to remain in this position for ten minutes. This is carried out daily by the patient.

The visualization roentgenologically of the presence of unremoved mastoid cells by means of iodized oil, the recurrent or chronic infection of which are responsible for the continuation of middle ear disease, the author believes to be of distinct diagnostic importance in cases of this type.

The unexpected therapeutic value of the iodin content of the oil in a number of these cases reveals additional advantageous possibilities. The author feels, therefore, that considerable benefit is to be derived from a further study of the use of iodized oil in cases of chronic otitis media purulenta and chronic mastoiditis from both the diagnostic and therapeutic standpoints.

The Treatment of Middle Ear Suppuration by Ionization. This report by J. D. McLaggan[7] is a critical survey of the results of treatment in 1601 cases of suppurative middle ear disease in children. The treatment is quite simple.

The ear is thoroughly cleaned by syringing and mopping, and a small pledget of cotton-wool wrung out in a weak solution of cocain and adrenalin is introduced into the meatus and allowed to lie in position against the tympanic membrane for three minutes. Thereafter as much pus as possible is sucked out into the meatus by means of Siegel's speculum and the child instructed to carry out Valsalva's method of inflation so as to clear the eustachian tube if possible. Then the meatus is again mopped dry. Sometimes the intratympanic tube was used to secure still more complete cleansing. The ionizing fluid introduced into the meatus is zinc sul-

(7) Lancet, May 11, 1929.

phate, grs. 2 to the ounce. If the perforation in the tympanic membrane is small, Siegel's speculum is used to ensure that the tympanum is filled with the fluid, the air in the cavity being first exhausted. The current used varies from 1 to 3 ma. and is passed over a period of from 10 to 15 minutes. Afterwards the ear is mopped dry and a small quantity of boric powder insufflated. No further treatment of any kind is given until the ear is inspected a week later. If, at that time, the ear appears perfectly dry the patient is instructed to report at regular intervals for examination. On the other hand, if the discharge continues, but some improvement is noted, the ear is ionized again. It is very rare for an ear which ultimately benefits by ionization not to show a marked improvement after two or three treatments.

Results.—It is always difficult to estimate the value of treatment, especially in a disease which undergoes periods of spontaneous improvement. In the table the author has included under the heading "dry following ionization" only those cases which were seen to be dry immediately after the treatment, and which were dry at the inspections carried out at intervals of two and three weeks. Moreover, the majority were inspected six months later.

Total number of cases seen	1601
Total number discharged dry	1111
Number of cases ionized	919
Number dry following ionization	485

Number discharged dry = 69.4 per cent. of total number seen.

Number dry after ionization = 30.3 per cent. of the total number seen.

Number dry after ionization = 52.8 per cent. of number of cases ionized.

When a case was discharged "dry" it was explained to the parent that there was still a perforation in the tympanic membrane, and that there was a likelihood of future ear trouble. Great stress was laid on the necessity of bringing the child back if this should occur. In all 101 cases, which had been finally discharged as dry following ionization, reported with a recurrence of

suppuration. This relatively high percentage (20.8) was accounted for mainly by the use of ionization when there was a predisposing factor to recurrence in the nose or pharynx. The preliminary enucleation of enlarged tonsils and adenoids was a great aid to permanent healing. A notable feature of the ears in which recurrence of the discharge took place was the almost unfailing regularity with which ionization cleared up the discharge a second time.

As it had been stated that the success of ionization was due to the thorough preliminary toilet and not to the ionization, it was decided to test the truth of this statement. A hundred cases which were judged likely to respond to ionization were treated by cleansing the ear exactly as for ionization. Alcohol drops were then introduced and kept in the meatus for 10 minutes, the ear was dried out, and boric powder was insufflated. In no single case was an ear so treated seen to be dry at inspection a week later. In many there was a considerable lessening of the discharge, but none were quite dry.

After experience had been gained it was not found to be difficult to foretell, with considerable accuracy, whether an ear was going to benefit by ionization or not. The following points were found to be the chief aids in prognosis:—

1. Duration of the Discharge.—In many cases successfully ionized the history of the discharge went back to infancy. A long history was not considered a very unfavorable point, but a long continuous history was of bad omen. Periods of intermission of several months' duration were favorable.

2. Character of the Discharge.—The most favorable type of discharge was the mucopurulent. The least favorable type was the persistently offensive, purulent discharge.

3. Original Cause of the Onset.—In the vast majority of the cases the parent was unable to give a definite cause of onset. Very often there was no history even

of pain. In those cases which followed measles or scarlet fever the results were much worse than in the majority with no definite history of onset. Of 159 ionized cases which owed their origin to these diseases only 41 responded to the treatment—a percentage of 25.8, which compares badly with the over-all percentage of 52.8.

4. Examination of the Middle Ear.—Success was almost entirely limited to those cases in which the infection was confined to the mucous membrane of the middle ear tract, and in which there was no obvious involvement of the underlying bony structures. Thus a favorable examination was one which revealed a perforation through the membrana tensa only, or encroaching on the bony tympanic ring to a very small extent. The mucous membrane of the tympanum as seen through the perforation, appeared to have its epithelial layer intact. The actual size of the perforation in the membrana tensa was not considered important. Those with a pin-hole perforation responded as well as those with a large one if care were taken to introduce the ionizing fluid into the middle ear by the use of Siegel's speculum. An unfavorable finding was the presence of granulations or polyps, which were looked upon as indicating a greater or lesser degree of bone necrosis. Equally unfavorable was a perforation through Shrapnell's membrane or through the outer attic wall. Perforations in this region usually seemed to be associated with cholesteatomata, and no success was obtained in those cases.

5. Examination of the Nose and Pharynx. — The presence of enlarged tonsils and adenoids, or other septic foci in the nose and throat, did not prevent the ear from responding to ionization, but they rendered recurrence frequent and rapid, and should be dealt with before ionization.

During the last six months of the period during which the ears were seen a special group of 21 cases was selected as being especially suitable for ionization. Of these cases no fewer than 19 dried up and have remained

dry until the present time. The large percentage (90.4) of dry ears obtained in this series affords grounds for the statement that, with experience, it was not a difficult matter to foretell with a degree of certainty whether an ear would answer to the treatment or not. These selected cases were not included in the table.

Harmful results followed the ionization of certain ears. The following are contraindications of ionizing:—

1. The presence of acute inflammation. The preliminary syringing appeared in some cases to carry infection to the mastoid antrum and precipitated an attack of acute mastoiditis. There were two cases which lent support to this belief.

2. Marked involvement of the structures in the mastoid process. It was found to be difficult to estimate the degree to which the mastoid process was involved, but ionization was feared in two classes of cases: first, those which gave a history of recurrent attacks of earache and mastoid pain, the attacks usually coinciding with a short period of cessation of the discharge, and being relieved by its renewed onset; secondly, cases which showed a postero-superior perforation with marked involvement of the bony tympanic ring and in which pus could be freely aspirated from the direction of the aditus.

3. The presence of manifest cholesteatomata.

4. A history of vertigo, with or without the presence of the fistula sign. Apart from the fact that these were usually cases in which there was evident bone necrosis, ionization readily produced in them an attack of giddiness, often with vomiting.

The advantages may be summarized as follows:—

(1) The treatment is an easy one for the specialist to apply and takes very little time.

(2) After experience had been gained, and the unsuitable type of ear omitted from the treatment, no bad result was obtained.

(3) It was found necessary to apply the treatment in children as young as four years of age.

Chronic Otorrhea—Its Treatment with Calot's Solution. The composition of this solution as given by I. Harnick[8] is: guaiacol 1.0, creosote 5.0, sulphuric ether 30.0, iodoform 10.0, olive oil 70.0.

Fussinger and Laurance attribute to the guaiacol and creosote a caustic action upon the granulations in addition to their antiseptic properties. The iodoform, besides being an excellent antiseptic, acts also as a very good cicatrizant. The ether serves the purpose of a solvent for the fatty components of the discharge, and thus allows the more active constituents a more intimate contact with the diseased tissue.

Upon instillation of the mixture active diapedesis of the polymorphonuclear leukocytes results. These leukocytes disintegrate, with a resulting liberation of their proteolytic and lipolytic enzymes which aid the bactericidal activities of the iodoform, and also assist in the destruction of granulations. The character of the discharge undergoes marked changes under the influence of this mixture. From a thick, mucoid secretion it becomes thin, serous, and brownish in color. The fetid character of the secretion sometimes disappears, even after only one or two instillations. The increase in the secretion is not on the basis of an exacerbation of the pathological process, but rather on the basis of an acute diapedesis brought about by the medicament. The marginal epithelium spreads under the influence of the modified secretion, covers the ulcerations, and epithelializes them. Hand in hand with the changes in the mucous membrane, the secretions decrease, and the originally rich bacterial flora diminish. When the secretion becomes markedly reduced, and what is left is due to the medicament, the instillations are stopped.

The author wishes to state that Calot's solution, while not a panacea, is exceedingly efficient when employed in

(8) Canadian M. A. J., May, 1929.

properly selected cases of otorrhea. This solution should be tried in cases of chronic osteitis before deciding on the radical mastoid operation. The basis of its efficiency in the treatment of chronic otorrhea, as described in Fotiada's original article, makes one believe that it deserves at least a fair trial in most cases of prolonged aural discharge.

It is of very little value in those cases complicated by cholesteatoma. Its use must be intermittent, insufflations of boric or zinc oxid powder being used to round off the treatment. Most cases of otorrhea, not due to cholesteatoma, and not on the basis of lues, diabetes, local malignancy or actinomycosis, respond readily to its use.

The Reasons for and Results of a New Operation for Deafness. J. N. Watt[9] believes this operation should be tried in those chronic catarrhal middle ear cases where it is impossible to inflate the eustachian tube. So far his results as regards tinnitus and hearing have been very gratifying. The operation allows for a tube from the antrum region and extending to the mastoid surface.

The Operation: The incision is made as for opening the mastoid antrum down to the bone. The periosteum is reflected in both directions. The antrum is opened and the aditus exposed. Opening of the aditus is made larger by chipping pieces off all walls except the floor. A small sound is introduced into the aditus and its patency demonstrated. All chips of bone are removed and the antral cavity swabbed out and dried. The tube is now slightly curved over an obturator so that the upper or external flange will be flat on the skin surface. Distance from the skin surface to the enlarged antral end of the aditus is measured off on the tube from the external flange and the surplus is removed by a fret saw and the end filed smooth. The tube is now put in position after being sterilized and the skin brought together between the two flanges and completely sewn up. It is advisable to leave the cap off the tube for

(9) Laryngoscope, November, 1928.

a day or two to enable any serous discharge which may present itself from the blood to drain away. The stitches are removed on the fourth or fifth day. With aseptic precautions there are no complications. The cap of the tube can be removed and replaced when desired.

The tube is made of: 24 ct. gold as it is easiest of manipulation. The tube is in one piece and turned so that there is no solder, and it is 1¼ inches long so as to allow for cutting. Distance between flanges is ⅛-inch. Width of flanges from edge of tube, an infinitesimal bit smaller than ⅛-inch. Cap is slightly larger than upper flange and flat, and works like the top of a collar stud.

A solid silver obturator slightly smaller in diameter than the tube is used. The tube is bent on this obturator to avoid kinking.

Primary Carcinoma of the Tympano-Mastoid: Case Report. In reporting an illustrative case M. Guttman[1] notes that carcinoma as a clinical condition in which the primary growth is found in the middle ear is decidedly less common than epithelioma of the auricle with secondary extension into the tympanic cavity. The latter is not so rarely observed. The neoplasm as a rule has its origin in the cavum, although the tympanic end of the eustachian tube and the mastoid cells may also be the site of the primary growth. There is in practically every case a preceding long continued discharge subsequent to a middle ear infection and perforation of the membrana tympani, although apparently carcinoma may appear in a case without any previous middle ear disturbance. It is for this reason (the otorrhea) that the growths protruding from a perforation in the drumhead are so often misdiagnosed as innocent granulations subsequent to aural suppuration. It is only after repeated removal and cautery of the granulations and their consequent flourishing recurrences that suspicion is aroused which prompts the microscopic examination that discloses the malignant nature of the process. As the growth

(1) Illinois M. J., August, 1929.

becomes larger the entire cavity is filled with a neoplastic mass, which by pressure atrophy erodes the surrounding structures. The aqueduct of Fallopius is early invaded and the ensuing facial paralysis is a characteristic feature of the disease. The involvement of the nerves and the pronounced pain that accompanies this adds to the misery of the affliction. The labyrinth may be invaded with typical symptoms of labyrinthitis that rapidly go on to meningitis and death. The mastoid process is almost always invaded and the extension may involve the sinus and give rise to a sinus thrombosis. Extension upwards through the tegmen tympani and antri with meningitis and brain abscess formation is also observed. The cervical glands are early affected and a characteristic preauricular infiltration with secondary involvement of the temporo-mandibular joint is seen in a large majority of cases reported. In almost all cases in which a microscopic examination was made the growth proved to be of the squamous cell type and highly malignant. Radical mastoid operation as well as radiotherapy with the *x*-ray and radium have all proven futile. Death as a rule is usually caused by meningitis, brain abscess, sinus thrombosis or hemorrhage.

Malignancy of the Middle Ear, Bilateral, with Autopsy Findings. G. E. Shambaugh and E. W. Hagens[2] state that the patient sought medical aid on account of stuffiness in the left nostril and this case is of interest because the patient was observed over a period of six years. Tissue was removed from the left side of the nose and proved to be epithelioma. Radium was applied and the tumor disappeared. After several years the patient noticed tinnitus in the left ear, and examination revealed a tumor mass in the upper part of the cavum tympani, shining through the drum membrane. Radium application did not affect the tumor development. The hearing tests showed mainly a defect for the upper part of the tone scale on that side, and

(2) Arch. Otolaryng., June, 1929.

practically normal reactions on the right side. The vestibular mechanism was intact.

Later, stuffiness recurred on each side of the nose. Tumor tissue was seen on both sides in the ethmoid region, and sections were again made from the left side. LeCount reported epithelioma. The tumor tissue disappeared from the nose a second time on the application of radium. The patient next noticed fullness in the right ear and tumor tissue was seen shining through the lower portion of the drum membrane. From this time on until her death (from another cause) she complained of increasing stuffiness of the ears, tinnitus, deafness, attacks of vertigo, and dryness of the nose. Facial paralysis on the left side was noted but the patient did not complain of it. The hearing tests showed gradual increase in deafness on both sides, especially the left, until very little was heard in this ear. The vestibular tests gave increasingly diminishing responses.

The gross examination of the right temporal bone did not show any outward evidence of tumor, but on the left side several masses of tumor tissue had broken through the tegmen tympani, and what was left of the middle ear cavity was filled in by tumor masses.

Microscopic examination of the right temporal bone revealed extensive tumor invasion of the cavum tympani up to the level of the epitympanic space. There was slight invasion of the bony capsule about the cochlea. For the rest, and particularly the cochlea and vestibular end organs, no tumor invasion was noted. The sections from the left temporal bone showed very extensive infiltration of the bony labyrinth, and extension of the tumor into the utricle, the cristae of the canals and the cochlear duct at its beginning in the vestibule. The saccule and most of the cochlea were free from the invasion. The seventh nerve region was replaced by tumor masses.

The tumor was fairly vascular and gave a papillary appearance under the microscope. The sections from

the nose appeared similar to those from each ear. Those from the ear appeared most like that of a basal cell carcinoma. It is probable that the tumor extended by direct growth from the nose backward and outward into each ear. The article is accompanied by a number of microphotographs.

Tuberculosis of the Middle Ear. J. D. Dwyer[3] has made a study of aural tuberculosis and offers the following summary:

Aural tuberculosis has received but scant attention in this country.

Our studies show that over 15 per cent of all cases of chronic discharge from the ears in childhood are tuberculous.

Children are especially prone to infection with the bovine type of tubercle bacillus by means of infected cow's milk.

Tuberculosis in cows is much more frequent than is generally known, particularly in rural communities.

Many cases of aural tuberculosis cannot be recognized by the clinical signs, the diagnosis being made by culture.

While encouraging reports have been published concerning the curative powers of heliotherapy, further investigation is needed to prove the true value of this therapeutic measure.

In aural tuberculosis, appropriate local, general and climatic treatment combined, in suitable cases, with injections of tuberculin, offers the best hope of a cure.

Otosclerosis

The Pathology of Otosclerosis. O. Mayer[4] describes the well known histologic appearances and gives his interpretation of otosclerosis.

(3) Arch. Otolaryng., April, 1929.
(4) J. Laryng. Otol., December, 1928.

"The original bone of the labyrinth capsule becomes absorbed by osteoclasts and a bone-marrow is formed, in which an excessive number of osteoblasts abound. In this marrow the new bone is formed, but is imperfect. It is reticulated, stains dark blue with hemalum and eosin, and contains a great number of large and irregularly situated bone-cells. This imperfect new bone becomes gradually surrounded by more perfect bone. Such tissue as the blue-staining bone is never seen in the normal labyrinth capsule or in other pathological conditions. It is this fact which gives the key to the character of this particular disease, since it can thus represent neither a physiological transformation nor an inflammatory development. Physiological transformation and regeneration processes of bone develop in quite a different way—never in discrete foci but always in irregularly dispersed canal systems. In physiological transformation and in inflammatory conditions, new blood-vessels enter the canals of the old bone.

"Further, in otosclerosis there is no exudation such as occurs in inflammation, and the bone spaces contain not granulation tissue, but an osteoblastic marrow."

Otosclerosis should be regarded as a hyperplasia of bone of an elementary and imperfect type. It is found in various forms: e.g., a sclerotic form with small marrow spaces with or without numerous osteoblasts, a fibrous form in which portions of the bone spaces are filled with fibrous tissue with few cells, and a vascular form in which the marrow spaces are filled with blood vessels. The author remarks that such variations in the type of tissue are characteristic of hyperplasias and tumors. He also states that one must regard the growth of these diseased foci as a tumor, since it begins as a swelling of the marrow, followed by ossification. These foci are like multiple exostoses, with which there is a close analogy. Their bilateral symmetry is evidence of their being a hereditary maldevelopment. The predilection of the foci for the promontory is explained by

the fact that there is a synchondrosis in this situation. Exostoses tend to grow from such sites. The otosclerotic areas in the labyrinth capsule are really pathological growths which arise in connection with embryonic maldevelopments.

In association with the otosclerotic changes there is frequently some malformation of the inner ear. Thus the author found three instances of otosclerosis in fifteen cases of congenital deafmutism from maldevelopment of the inner ear. In two other cases there were bony changes similar to otosclerosis, and in one there were multiple exostoses. On the other hand, he found slight maldevelopment of the inner ear in fifteen of thirty temporal bones with otosclerosis.

As regards the atrophy of the labyrinth almost always found in connection with otosclerosis, the author holds that the areas of otosclerosis themselves are only in a few cases the cause of the affection of the inner ear; in most cases no such connection can be demonstrated. More often the cause consists in the fact that in the inner ear of patients suffering from otosclerosis there is a lack of development which is demonstrated, firstly, by certain malformations and, secondly, by a peculiar tendency of the connective tissue of the inner ear to become ossified. This peculiarity leads to a faulty arrangement of tissue and terminates in a gradual atrophy of the labyrinth.

The author states that it is certain that otosclerosis shows no relationship with osteomalacia or rickets.

Histologic Investigations Concerning the Beginning of the Otosclerotic Disease of the Bone. The opinions concerning the beginning of otosclerosis differ materially. Doederlein[5] tried to learn whether a progressive or retrogressive process is present in the beginning. He made histologic examinations in six cases and came to the conclusion that the vessel coats of Manasse are a stage of the otosclerotic disease of the bone. They must be

(5) Ztschr. f. Hals-, Nasen-u. Ohrenh., Nov. 10, 1928.

taken for the initial stage, because in some cases no otosclerotic foci are present, except the changes in the vessel coats. The view that a retrogressive bone process is the beginning of the disease allows certain conclusions which explain the nature of otosclerosis. The result of the investigations contradicts Manasse's conception of a pronounced inflammatory chronic progressive disease process, and also the views of Otto Meyer and Lange, who think that the disease is a tumor formation. The latter view is improbable, because otosclerotic changes in the bone have so far not been found in children under the age of 4 years, although a large number of petrous bones of children have been examined. This negative observation induces the author to state that the disease is not a hereditary malformation but that it develops postembryonically.

Wittmaack claims that the beginning of the disease is a resorption process of the bone in the surrounding of the blood vessels. This view corresponds with the result of the investigations of the author. So far, it cannot be told with certainty whether the causative factors of the bone resorption are of a local nature, as Wittmaack's observations seem to show, or whether they are of a general character, as the clinical experiences seem to prove. It is possible that the same rebuilding process of the bone may be the result of various causative factors, local as well as general. The author inclines to lean to the latter view, because a comparison of the described pathologic changes of the bone in the capsule of the labyrinth with the bone changes in rickets and osteomalacia shows a surprising identity, especially if the specimens are stained with thionin.

Therefore, the author repeats the statement made in an earlier publication, that otosclerosis represents a bone process at least similar to that found in rickets and osteomalacia. These latter diseases are undoubtedly based on a general cause; therefore, a general cause must be accepted also for otosclerosis. The differences

of the bone changes correspond with those in rickets and osteomalacia and can be explained by the peculiar nature of the bone of the labyrinthian capsule. This view gains weight because it fits in well with the clinical experiences in otosclerosis. The investigations of the author referred only to the beginning of the disease in the bone. The various authors agree about the subsequent course in which extensive new formations of bone take place.

The Clinical Aspect of Otosclerosis. L. A. Leeson[6] reports on the clinical aspect of otosclerosis based on a study of 1,015 cases. Seventy-three per cent of the cases occurred in females and 27 per cent in males. In 290 cases the patients were under 20, in 298 cases from 20 to 30, and in 419 cases over 30 years of age. A definite history of family deafness was obtained in 36 per cent. Fifty-three females stated that the deafness had become distinctly worse since pregnancy. There was deafness in 1,003 cases and marked tinnitus in 644 cases. Giddiness was reported by 74 and neuralgic pain by 61 patients. The drumhead was normal in 910 patients (80 per cent) and in 114 the congestion of the promontory could be seen through the transparent drum. In the remaining 105 cases the patients showed abnormality of the drumhead. The eustachian tubes were patent in 497 cases, while in 81 there was slight obstruction. In the majority, the hearing was not improved by inflation. The condition of the nose was noted in 922 cases and was normal in 420. Bone conduction was lengthened in 767, normal in 41, and shortened in 47 cases. The Rinne test was noted in 966 cases. It was negative for both ears in 648, positive in one and negative in the other in 249, and positive in both ears in 69 cases. The lower tone limit was raised in the large majority. *C 32* was not heard in 884 cases, and *C 32* and *C 64* were not heard in 677 cases. The upper tone limit was tested in 574 cases, and in 300 it was lowered. Whisper and voice

(6) J. Laryng. Otol., February, 1928.

test showed a high degree of deafness in the majority of cases.

Otosclerosis: Its Clinical Aspect. F. R. Nager[7] also contributes a paper on the clinical aspect of otosclerosis, based on the observation of 835 cases. The sex ratio was 1 male to 1.8 females. The age at which symptoms first appeared was usually between 20 and 30. Fifty per cent of all the patients dated the commencement between the ages of 15 and 30 years. Heredity and simultaneous familial occurrence were found in 141 cases, heredity alone in 270, and familial occurrence in 78, a total of 58.6 per cent. The frequency of heredity is the main point of the hypothesis that otosclerosis is a constitutional disease, and this is further supported by its frequency in both ears. In Nager's cases 114, or 30.6 per cent, were one-sided. In 95 per cent of his cases, the deafness was progressive.

Tinnitus was present in 68 per cent. In 70 per cent the ear drum was normal, and in 20 per cent there was redness of the promontory. With regard to the influence of pregnancy, there is the feeling that this has been exaggerated. Nearly half of the patients in his cases were unmarried. The disease started earlier in the unmarried patients, so that half of them were distinctly hard of hearing at the age of 25. In 16.5 per cent pregnancy had no harmful effect, while in 46 per cent a change for the worse had been noticed, but mostly after repeated pregnancies.

Otosclerosis: Its Treatment. A. A. Gray[8] states that the deafness in cases of otosclerosis is due rather to the suspension of function of the organ of hearing than to its actual destruction. This view is supported by the prolonged bone conduction, paracusis, and the fact that in some patients the hearing may be improved momentarily by the inhalation of amyl nitrite.

It is unlikely that the deafness of otosclerosis is en-

(7) J. Laryng. Otol., January, 1928.
(8) Ibid.

tirely due to the fixation of the stapes. The improvement following treatment with amyl nitrite could not be due to loosening the ankylosed stapes. More probably the deafness is due to lowering of the function of the neurons concerned with hearing.

Phylogenetically, the hearing organ is late in development, and as a result the blood vessels and vasomotor nerves as well as the actual sense cells are subject to variation. Gray states the belief that otosclerosis is a process involving the organ of hearing as a whole. Neurons that are phylogenetically younger become myelinated relatively late. A neuron continues to grow until the subject is 30 or 40 years of age and anabolic processes predominate over the catabolic. For some years later the two processes are fairly evenly balanced, and later still the catabolic processes begin to predominate as age advances, and degenerative changes begin. The most delicate part of the chain of neurons is the synapse, and as degeneration occurs, it takes greater energy for the impulse to pass the synapses.

Paracusis is explained as being due to poor insulation of the myelin sheaths of the axis cylinders. Nerves along which strong impulses are passing may, through defective insulation, allow their impulses to spread to adjacent nerves along which only weak impulses are flowing and so reinforce them that they can overcome the resistance at the synapses.

Tinnitus similarly may be due to bared nerve endings, which in nerves of common sensation always register pain.

Whenever the organ of hearing is called on to function, the blood supply to it must be increased if it is to function satisfactorily, and this is brought about by the vasomotor neurons developed with the organ. If the vasomotor function is impaired, it means that the sensory neurons do not obtain their proper nourishment and hence do not function properly. Cellular changes do not necessarily occur in the nerve elements, but in

the bone, in which constant cellular and structural changes are normally occurring, a deranged vasomotor system would probably produce structural changes in the bone, especially at points of greatest stress, such as the bone round the oval window. The author makes the following suggestions:

"Otosclerosis is a degenerative process affecting the organ of hearing as a whole. (The semi-circular canals and vestibule are not parts of the organ of hearing, and are therefore excluded.) In some cases, the nerve-structures are relatively the most affected and in others the bony or connective tissues; and the signs and symptoms may, therefore, vary within considerable limits. It is probable that this degenerative process results from an inherent defect in the neurons concerned in the function of hearing. This includes the neurons of the vasomotor system, which regulate the blood supply of the organ, as well as those concerned in transmitting nerve-impulses from the organ of Corti to the cerebral cortex."

With regard to treatment, the author found that anemia is one of the commonest conditions associated with otosclerosis. Focal infection is the next most frequent condition. Patients with these conditions must be treated accordingly. Sleep is most essential for patients with severe tinnitus, and the general bodily condition must be built up.

Mastoiditis and Intracranial Complications

A Positive Symptom of Mastoiditis. According to M. Berger[9] a positive symptom of mastoiditis which appears frequently is spasm and rigidity of the upper third of the sternocleidomastoidus muscle. This symptom is most marked and is found more often in children. It is seen more often in those adults whose mastoid

(9) Ann. Otol. Rhin. & Laryng., March, 1929.

cortex is thin or whose mastoids have been perforated. The spasm and rigidity depend upon the extension of the suppurating process. In an acute suppurative otitis media there is mastoid pain and tenderness, but never spasm and rigidity, as the only pathology found is red and swollen mucous membrane lining the cells. Spasm and rigidity are found only when the mastoid cells have undergone necrosis.

This symptom is best elicited by gently palpating with the fingers of both hands and comparing both sides. It is only of significance when it is present, and the absence of this symptom means nothing, so that the diagnosis of the underlying conditions will have to be made on the associated symptoms.

[The above symptom when associated with other symptoms may well be called pathgnomonic. The condition of the muscle together with a boggy feel about the tip of the mastoid has not received the attention deserved.—Ed.]

The Prognosis in Mastoid Disease. E. Watson-Williams[1] gives his conclusions on a series of 250 patients upon whom he performed mastoid operation:

1. Primary mastoid disease is an affection especially of early life and not rare even in nurslings.

2. The mortality of mastoid disease is largely due to delay in treatment, and therefore preventable. Sigmoid sinus thrombosis is the most frequent of fatal complications.

3. The operative risk, apart from existing complications, is practically the risk of the anesthetic.

4. A dry ear and good or at least fair hearing should result from operation in almost every case of primary acute mastoid disease suitable for the Schwartze operation.

5. Operation should give a dry ear in 80 per cent of chronic mastoid disease. When the Schwartze opera-

(1) Practitioner, January, 1929.

tion is suitable the same proportion should have at least fair hearing.

6. After the radical operation, good hearing is the exception; 80 per cent of patients should have dry ears, while actual otorrhea is unusual. In many, material gain in general health as well as relief of local symptoms may be expected.

7. Associated disease of nose and nasopharynx is frequent and requires treatment.

Etiology of an Epidemic of Enteritis, Associated with Mastoiditis in Infants. G. F. Dick, G. H. Dick and J. L. Williams[2] report an epidemic characterized by diarrhea, loss of weight, regurgitation, fever, otitis media and mastoiditis, in an institution for infants, There were 27 fatal cases. The tympanic membranes were incised in eleven cases and mastoidectomy done in 5; surgery had no apparent effect on the course of the disease. All five patients on whom mastoidectomy had been performed died. In the early stages of the disease the intestinal manifestations were more marked and the mastoid lesions less advanced than in those who survived the first week or two of illness. Later, the enteritis subsided and the mastoiditis became marked.

Bacteriologic studies showed that there was an invasion of the blood stream by the organisms found in the pus from the mastoid, these being mainly colon bacilli and green-producing streptococci. In order to determine whether the disease was primarily an infection of the upper respiratory tract, with a secondary otitis media and mastoiditis, or a primary infection of the alimentary tract, resulting in a septicemia and secondary mastoiditis, nose and throat cultures were made of all sick and well patients in the institution. The two groups showed the same bacteriology. Green-producing streptococci predominated in throat cultures, staphylococci and pseudodiphtheria bacilli being present only occasionally.

(2) Am. J. Dis. Child., June, 1928.

The green-producing streptococci found in the mastoid post mortem were similar to those found in the throat cultures of both the sick and the well infants. These organisms are normally present in infants; this observation, therefore, did not mean that these organisms were the primary cause of the epidemic.

The fact that colon bacilli were found in mastoid cultures at operation indicated that their presence was not merely a terminal affair but that the intestinal infection was possibly the primary factor. At subsequent autopsies additional studies revealed a Morgan dysentery bacillus, *Proteus asiaticus* and *Eberthella pyogenes*. The Morgan dysentery bacillus was highly pathogenic.

These observations indicated that the epidemic was not due to an air-borne infection, but was of intestinal origin. Measures were taken to insure the sterility of all food, comprising the autoclaving of bottles and nipples, and the wearing of sterile rubber gloves by nurses for all feedings and giving of water. The epidemic promptly subsided after the adoption of these measures.

The authors believe that this was an epidemic of enteritis, associated with mastoiditis, and caused by a primary intestinal infection in which the Morgan dysentery bacillus was found. The epidemic was promptly controlled by the sterilization of all feedings.

Mastoiditis in Acute Nutritional Disturbance. L. Richards[3] reports that an investigation of the conditions of the ears of 100 babies suffering from acute nutritional disturbances showed one or both drums open in 44 cases, a group in which the mortality was 66 per cent. In 12 cases a single or double mastoidectomy was done with 9 deaths.

In the author's opinion, local aural infection is not such an important etiological factor in acute nutritional disease as has been frequently assumed.

Histopathology of Sinusitis and Mastoiditis. In the study of histopathologic conditions in the mastoid B.

(3) Arch. Surg., April, 1929.

J. McMahon[4] found two outstanding tissues were the mucosa and the bone, the most prominent pathologic changes being found in the former. This was more or less edematous and infiltrated with polymorphonuclear leukocytes or young connective tissue cells. The polymorphonuclear leukocytes occurred in clumps or individually, usually in large numbers. In cases of longer standing, chronic cases with acute exacerbations, the polymorphonuclear leukocytes were still in evidence, but the connective tissue cells were older and of the spindle-shaped type. In certain specimens well established fibrosis was present. The bone was practically always sclerotic, with no evidence of bone spaces. About the only change present was some evidence of calcium absorption. Rarefaction, necrosis and hyperostosis were noticeably absent.

True necrosis of the bone occurred infrequently. In certain specimens there was a marginal fragmentation and disintegration of the substance of the bone in which it showed a certain number of specimens from the mastoids of infants, showing edema and marked cellular infiltration of the tunica propria sharply contrasted with others showing very little edema and marked fibrosis of the tunica propria. No pathognomonic bone changes were evident in either.

It is quite evident that the response of the mucosas of the nasal cavity, the paranasal sinuses and the mastoid cells and antrum to infection is similar in many respects.

Acute infection of the mucosa was characterized by the generalized invasion by young connective tissue cells, red blood cells and polymorphonuclear leukocytes, the edema of the tunica propria, the dilatation of the mucous glands and the absence of bone changes. Chronic infection was established by the thickening, the metaplasia or sloughing of the epithelium, the large numbers of older connective tissue cells in the tunica propria, the

(4) Ann. Otol. Rhin. & Laryng., September, 1929.

absence of free red blood cells, the replacement of polymorphonuclear leukocytes by lymphocytes, the thickening of the blood vessel walls and the destructive changes in the bone.

Mastoiditis as Seen in Investigations of Whole Temporal Bones and Bone Splinters. In this well illustrated article, O. Mayer[5] takes issue with some heretofore accepted ideas, and comes to the following conclusions:

Mastoiditis is initiated by an exudative inflammation originating in the tympanic cavity and progressing by continuity through the antrum, running its course almost entirely in the air-containing spaces.

As early as the fourth day, in some cases, besides the exudative reaction there may be seen resorption of bone by osteoclasts in the small bone vessel spaces, also new formation of bone as osteoid seams in both the vessel spaces and the pneumatic spaces, although the resorption and new formation are scant.

The exudative stage predominates for about a week and is then replaced by the proliferative stage, indicated by the formation of granulation tissue. During the granulation stages, there is resorption of bone. This seldom occurs by osteoclasis of the walls of the pneumatic cells, but occurs principally in the vessel spaces and usually in the newly formed vessel spaces.

Cortical perforation takes place through the outgrowth of granulation buds.

The disease process is in the region of the pneumatic spaces, progressing through the septums and cortex. Hematoplastic and fatty marrow as found in nonpneumatic mastoids is not primarily involved, but is involved when pneumatic cells are scattered through marrow spaces.

Demarcation and healing of suppuration can occur, but often there may be extension of the suppurative process into the depths of the bone, where it may be

(5) Ztschr. f. Hals-, Nasen-u. Ohrenh., 18: 628, 1927-1928.

difficult to gain access for operation. In streptococcus mucosus infections, it was frequently noted that the process extended along the posterior surface of the pyramid toward the front and from there broke through the dura; this should give some guidance in operative work.

There are some cases which are largely exudative and others in which proliferation of inflammatory tissue predominates. In the first group are the stormy types, e. g., in influenza, and in the second the insidious types mostly produced by streptococcus mucosus. Between these two types are many gradations.

Acute Surgical Mastoiditis Following Fracture of the Skull. C. H. McCaskey[6] believes that the frequency with which this condition occurs is sufficient to warrant a discussion of the subject.

Fractures of the skull, especially about the base, are usually produced in one of three ways:

1. Violence may be directed to the vertex, or to some part of the cranial convexity, as from a fall or blow upon a hard substance.

2. Direct or indirect injury is the cause of a certain number of these fractures, as by some pointed object being thrust through the upper wall of the orbit, up the nasal cavity, through the cribriform plates, or by gun shot or stab wound.

3. The impact, or the resistance of the vertebral column against the occipital condyles, produces fractures of the base, as by falling from a distance and alighting on the heels.

The fractures may run in any direction, longitudinal, oblique, or transverse, according to the compressing or fracturing force, and may affect any part of the base. They may follow the sutural lines, but it is not uncommon to the dense petrous bone, as well as the mastoid process. Naturally, transverse fractures are more likely to be confined to one fossa, while longitudinal may in-

(6) J. Ind. M. A., May, 1929.

volve them all. Some fractures at the base of the skull are simple, but most of them are compound.

Fractures of the middle and posterior fossae are of most importance to the otologist, for the reason that in this area are located structures which are of importance, i. e., the apparatus for hearing and equilibration, the temporo-mandibular articulation, the jugular bulb, lateral and petrosal sinuses. These cases may or may not have labyrinthitis, involvement of the cochlea, facial paralysis, or mastoiditis. Mastoiditis is the complication under discussion, and after reviewing some of the literature, the author reports four cases which have come under his observation.

All four cases had a line of fracture which passed through the mastoid process involving posterior bony meatal wall or posterior wall of the middle ear.

Three cases reported by the writers quoted, and two cases reported by the author were fractures of the skull with involvement of the mastoid. They would fall in the first classification as to cause of fracture. Two cases reported by the author would fall in the third classification.

Two cases had perisinus abscess. All but one case had bleeding from ear which would indicate a rupture of the membrana tympani. One case had the complication of sinus thrombosis with multiple abscesses. In five cases there was evidence of slight or grave neurological symptoms and two cases revealed no symptoms. Organisms found were hemolytic streptococcus, staphylococcus aureus, streptococcus mucosus encapsulatus and gram positive bacillus unindentified. Laboratory findings were helpful in all cases where obtained.

The author concludes that the cases of fracture of the skull, where there is bleeding from the ear, should be examined by an otologist, and where there is a fracture involving the mastoid, they should be in constant attendance. If there is evidence of complicating mastoid-

itis, operative procedures should be carried out at the earliest moment.

"**Suction Mastoids.**" J. C. Scal[7] reports four cases of acute otitis media with mastoid operation following the suction treatment. His conclusions are:

Paracentesis should be performed in all cases of acute otitis media. Repeated incisions of the drum are not only unnecessary, but are contraindicated. If signs of involvement of the mastoid persis after paracentesis, they are generally due to involvement of the mastoid through the lymphatics and contiguous tissues, and could not have been prevented in any way.

The fallacy of the application of suction in cases of otitis media purulenta acuta is seen easily. Most of these patients eventually come to operation, and there is always more or less loss of hearing because of the pathologic condition caused by the marked traction on the occicular chain produced by the suction.

In the cases recorded, it will be noticed that in each either a perisinus or a subdural abscess was present.

Suction should never be applied to the ears.

Delayed Zygomatic Mastoiditis. J. B. Horgan[8] believes it justifiable to assume that delay in the appearance of this condition is a clinical peculiarity. There are three possible explanations of this delay.

The first is that the spread of the infection along the connecting link of cells between the zygoma cells and those of the mastoid proper, while not discernible at the time of operation, may nevertheless continue in a desultory manner until it reaches the terminal and larger cells in the zygoma or squama, the subsequent course of events being then determined by the bodily resistance or some other factor.

The second explanation is that, as suggested by Heine, the infection may creep from the epitympanic recess into the spongiosa between the two layers of compact bone

(7) Arch. Otolaryng., March, 1929.
(8) J. Laryng. & Otol., May, 1929.

forming the roof of the external meatus at a comparatively late period of the disease and invade the zygoma from there. In Holmgren's opinion, zygomatic or squama cells originating from the recessus and without direct communication with the antrum may be present.

As a third explanation, the author suggests that, having reached the region of the glenoid fossa by way of the glaserian fissure, the infection may, after a variable interval, give rise to symptoms which would have a clinical resemblance to those resulting from a zygomatic abscess which had broken out in front of the zygoma root. The possibility of the spread of infection by this route is evident when it is remembered that the postero-internal attachment of the capsule of the mandibular joint above is anterolateral to the glaserian fissure, and that the latter is pervious to the tympanic branches of the internal maxillary artery, lodges the slender process of the malleus, and transmits the chorda tympani nerve from the tympanum by the canal of Hugier. It is readily apparent, therefore, that an infection passing through this fissure may cause trismus and give rise to an abscess beneath, in, or superficial to, the temporal muscle, and that, because of the relative relaxation of the surrounding tissues, it may take time to develop or at least to become manifest.

Facial Nerve Danger Points in Mastoid Surgery. According to A. H. Andrews,[9] of all the disasters following mastoid surgery there is only one greater than facial paralysis and that is death itself. The thought of this calamity lies back in the mind of every operator in every operation as a possible sequel. It is impossible to determine the percentage of cases of mastoid operation in which facial paralysis does occur as one of the sequelae, but the estimate has been made that it occurs in between two and three per cent of the cases.

It is important to note that the external wall of the Fallopian aqueduct where it crosses the inner wall of

(9) Illinois M. J., June, 1929.

the tympanic cavity is very thin. In some specimens the wall has dehiscences and in others the outer wall is almost entirely absent. To those who practice curettement of the inner tympanic wall in their tympanomastoid operations the danger in this locality is one of real importance. The author's impression is that the good to be accomplished by curettement in the ordinary radical mastoid operation does not compensate for all the danger to the function of hearing or to the integrity of the facial nerve.

Another point is the relation of the nerve to the posterior attachment of the drum membrane. Following the downward curve adjacent to the horizontal semicircular canal the nerve follows a course directly downward. It swings neither forward nor backward, inward nor outward. Because of the slanting position of the membrane the upper part of the membrane lies more superficial (surgically) than the nerve while its lower part lies deeper than the nerve. Directly back of the middle of the posterior attachment of the membrane and on the same level, *i.e.*, the same distance from the outer surface of the temporal bone, lies the facial canal. The distance from the annulus to the canal at this point varies from two to three millimeters. Hence in removal of the posterior wall of the canal in radical mastoids the annulus tympanicus can be chiseled away above its middle, but below its middle it must be let alone.

Also the nerve in its downward course through the temporal bone frequently passes through cancellous bone, *i.e.*, the mastoid cells extend entirely around the nerve, and the deep perpendicular cells may extend several millimeters deeper than the nerve. In attempting to exenterate the deep perpendicular cells and those more superficial which extend around the nerve great care must be exercised, but when these cells are suppurating, or are broken down, or when the lateral sinus is located superficially and is placed well forward even greater care becomes imperative.

One frequently hears of abnormalities in the course of the nerve in its passage through the temporal bone, but in the performance of several hundred mastoid operations on the cadaver the author has never found any considerable variation in the position of the nerve although there is much variation in the structure of the bone through which the nerve passes.

The Modified Radical Operation on the Mastoid. C. H. Smith[2] states that the essentials of the so-called modified radical mastoid operation are: exenteration of the mastoid cells, wide exposure of the antrum and the zygomatic region, a lowering of the posterior bony wall of the canal to within from one-eighth to one-fourth inch of the epitympanic bony ring, exposure of the attic by removal of a variable amount of its external wall, a plastic flap and drainage through the external auditory canal, with closure of the posterior wound.

The author concludes:

1. There is a distinct well proved niche in otologic surgery for the modified radical operation on the mastoid.

2. In this country, the operation has not had the following it deserves but its advocates, though few in number, are warmly enthusiastic about their results.

3. This want of popularity is principally due to a lack of information concerning its indications, technic and results.

4. The modified operation is particularly indicated in cases of chronic otitis with small perforations in the upper part of the drum, when the hearing is still good, this is, the voice can be heard at a distance of 2 meters or more.

5. The modification can also be tried on patients with good hearing when the other ear is severely compromised, even though the perforation may be located less favorably.

6. In nearly all cases of the former class and in

(2) Arch. Otolaryng., February, 1929.

many of the latter, a dry ear with cicatrization of the perforation and an improvement in, or at least a conservation of, power of hearing may be expected.

7. The results as to audition through the preservation of the drum and ossicles are much superior to those obtained by the complete radical operation, and the postoperative healing time is much shorter.

Further Experience with the Dichloramin Treatment of Mastoid Wounds. Ralph A. Fenton[3] summarizes the results of his studies by plating, which roughly reproduce the effects of bacterial growth in a film of blood-clot overlying the fresh cut bone of the mastoid. He finds reduction of colonies from one-twentieth to one-twenty-five-hundredth of the number multiplying without exposure to dichloramin. In the tubes of broth, which indicate roughly the speed of bacterial multiplication in serosanguineous exudates at body temperature, dichloramin reduces growth 400 times in one case and 40 times in another during 24 hours; while after 48 hours there is no growth at all. The average proportion of reduction of growth from the plate cultures under dichloramin is one-nine-hundredths of the ordinary amount, in this series and for these strains of hemolytic streptococci from the mastoid.

Otherwise stated, he feels that belief is justified in the inhibitory action of dichloramin-T upon bacterial growth in acute mastoid wounds; and he feels that herein lies the explanation of the clinical facts heretofore presented, namely, the rapid disappearance of pus from wounds so treated, formation of healthy granulations, slight toxic absorption, lessened superficial necrosis and tissue loss. The resultant wound exudate is characteristically mucoid, reddish and relatively low in exfoliated cellular structures. Recurrence of yellow pus in the ear, or in a wound so treated, is suggestive of reinfection of the ear and mastoid from the throat, or

(3) Ann. Otol. Rhin. & Laryng., September, 1929.

of extension of the purulent process into unopened cellular structures.

Dichloramin is useful daily during the first week or ten days of the healing process; thereafter mercurochrome or silver solutions are used externally, as it may seem necessary to secure smooth healing.

His preference is still for the wide open wound, with one or two sutures at the ends. Such a wound is filled full of oil, which is "held in" by a lightly inserted fold of narrow oil-soaked gauze packing. Removal and insertion of such oil-soaked material is painless; the depths of the wound are not packed, swabbed, or otherwise disturbed.

Conclusion: Bacteriologic examination based on virulent cultures bears out eleven years of clinical experience in many hundred cases, demonstrating the value of dichloramin-T, 2 per cent in chlorcosane, as a routine dressing in acute mastoid surgery, not only for its remarkable inhibitory action on bacterial growth, but also for shortening materially the duration of after treatment.

A New Operation for Chronic Purulent Mastoiditis. J. M. Smith[4] has performed a large number of radical operations during the last fourteen years. After following a number of these cases over that period of time, he believes that there are certain well defined objections to this operation. The chief objection is the large postoperative bony cavity resulting from the removal of the bony canal wall and the necessary plastic flap. There is a continual exfoliation of dead epithelium in this cavity which cannot be successfully removed by the patient. This frequently mixes with cerumen and becomes moist, causing an erosion of the skin with a secondary infection. In other cases the eustachian tube will refuse to close, or having closed will reopen following a pharyngeal infection with a return of the discharge, or the infection will burrow under the skin

(4) M. J. & Record, April 3, 1929.

from the eustachian tube and open in some other part of the cavity, requiring a secondary operation to relieve the fistulous tract. Again, despite the best of care and technic the cavity will fill with granulations following the operation, causing a very decided loss in hearing and at times a secondary operation. It is necessary for the patient to consult the aurist at different intervals during the rest of his natural life. The time required for the different treatments, as well as the expense involved, becomes a severe burden in many of these cases.

It occurred to the author that if a satisfactory operation could be devised whereby the postoperative cavity and plastic flap might be avoided many of these difficulties would be overcome. Upon this theory the following operation was developed. Its principle depends upon the thorough removal of the diseased tissue and bone in the middle ear, attic, antrum and mastoid cavity without removing the posterior bony canal wall, thereby obtaining a complete dermatization of the middle ear with a solid postauricular union as obtained after the simple mastoid operation. This is accomplished by first removing the diseased contents of the antrum and mastoid cavity. Then the opening from the mastoid antrum to the middle ear is enlarged by removing some of the inner part of the bridge, just external to the incus. The bony canal wall is allowed to remain in its normal position. The posterior half of the membranous canal is separated from its bony attachment and held in place against the anterior canal wall. Through this opening, and the enlarged additus, the contents of the middle ear and attic are removed. The posterior part of the membranous canal is then restored to its normal position, the middle ear allowed to dermatize while the posterior wound heals completely with healthy granulation tissue. (Fig. 50).

The decided advantages of this procedure over the radical operation are due to the removal of the diseased

contents of the middle ear and attic without disturbing the posterior bony canal wall. Allowing the posterior wall to remain in its normal position avoids the postoperative radical cavity and plastic flap. It is easier to keep the internal wall of the middle ear free from granulations after the operation. The subsequent hearing is largely dependent upon this one factor in any operation requiring the removal of the ossicles. The exenteration of the diseased tissue of the middle ear and mastoid is

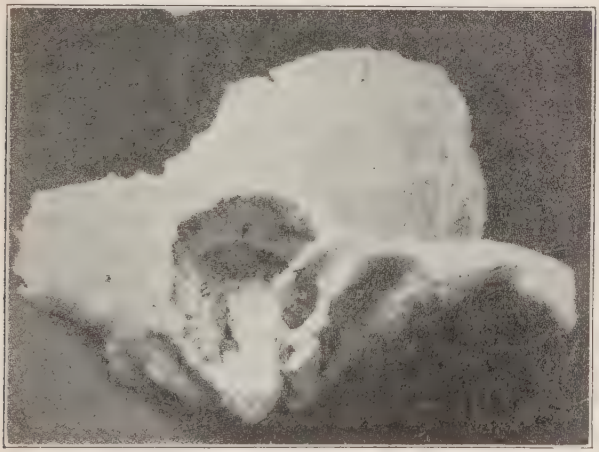


Fig. 50—Left temporal bone showing completed operation. A, posterior bony canal wall. B. middle ear. C. horizontal semicircular canal. E. lateral sinus plate. F. dural plate middle fossa. X. showing removal of bone from external attic wall.

practically as complete as that following the radical operation with the exception of the removal of the posterior bony canal wall.

The normal tubular external auditory canal remains to collect and convey the sounds directly to the internal wall of the middle ear.

[The most frequent cause of chronic suppurative otitis media is probably cholesteatoma. In performing the tympano-mastoid operation when cholesteatoma is present it is impossible to know that all the epidermal membrane has been removed from the mastoid cavity, and

that cholesteatoma will not form. The older operators tried to avoid this by turning the mastoid into a large, deep dermatized post-auricular cavity. The later operators try to avoid this unsightly cavity by connecting it with the auditory canal and closing the skin wound behind the ear. Most operators still believe the latter plan is best, especially when the external meatus is enlarged sufficiently to allow for the easy escape of exfoliated epithelium and cerumen.—Ed.]

Complications of Otitis Media and Mastoiditis. In review of much of the literature on otitis media and mastoiditis, E. C. Campbell[5] found many excellent articles describing in detail some of the more important complications, but nowhere could he find a collection of all these complications. In most of the contributions great stress has been laid on the symptomatology, diagnosis and treatment of lateral sinus thrombosis and brain abscess, but little or no mention has been given some of the less common conditions that complicate middle ear disease. The writer has attempted to make such a collection of complications, giving attention only to some of the pathologic features, with some statistical data, and giving practically no mention to the symptomatology or treatment of these conditions.

In purulent infections of the middle ear there is an involvement of the mastoid process in a very high percentage of cases. When pus has collected in the middle ear sufficient to cause only a slight bulging, it can be assumed that the pus has already invaded the antrum and any of the adjacent mastoid cells that communicate freely with it. The middle ear does not have to be full of pus and under tension to cause extension to the mastoid. The antrum is not closed off from the middle ear by any barrier that requires a force or pressure to break down, but is directly connected with the attic of the middle ear through the aditus ad antra, a channel that is always open. If a patient with a purulent otitis

(5) Ann. Otol. Rhin. & Laryng., March, 1929.

media were always in an upright position it might be true that pus would not reach the aditus ad antra until the middle ear was full of pus, as this opening into the antrum is at a high level. However, a patient with otitis media does not keep his head erect all the time, and so pus or infective material in the tympanic cavity can easily flow into the antrum when only a small amount may be present.

When infected matter reaches the antrum and adjacent mastoid cells, whether or not an active mastoiditis is set up depends upon a number of factors, chief of which are the virulence of the infective organism, the resistance of the patient and the drainage from the middle ear either through the eustachian tube or through an incision or spontaneous perforation in the drum.

The great majority of such infections of the antrum and adjacent cells recover without an active infection of the mastoid, but others go on to involvement of the cells with the formation of pus and the breaking down of the cell walls. Even this active purulent mastoiditis is not of itself a serious menace to life, but it is the complications that follow or accompany it or the acute otitis media that cause conditions that often result in impairment of the functions of the ear or seriously menace the life of the patient.

This development of the mastoid cells has much to do with the complications following their infection. It has been found that there is a great variability in the amount of pneumatization of the mastoid in different people. While ordinarily the mastoid process is undeveloped and has not become pneumatized in infants, it has not infrequently been found that a child under a year old has quite extensive development of the cells. On the other hand, in some adults only a part of the process is ever invaded by cells. In such cases there might be no cells close enough to the sigmoid sinus to cause its infection by direct extension. In other cases with an extensively pneumatized mastoid, the cells may

be in close proximity to the sigmoid sinus, the dural covering of the brain, the facial canal, the internal ear structures, and other cranial nerves, so that an infection would be more likely to cause complications in these structures.

The variation in the thickness of different parts of the mastoid cortex has much to do with the extension of an infection into the tissues of the neck to form cervical abscesses.

The following complications are discussed:

1. Lateral sinus thrombosis.
2. Septicemia.
3. Metastatic abscesses.
4. Cavernous sinus thrombosis.
5. Brain abscess.
6. Perisinus abscess.
7. Subdural or intradural abscess.
8. Perilabyrinthitis and labyrinthitis.
9. Meningitis.
10. Facial paralysis.
11. Gradenigo's syndrome.
12. Eye complications.
13. Erysipelas.
14. Dermatitis of the external ear.
15. Parotitis.
16. Focal infection.
17. Gastrointestinal disturbances.
18. Cervical abscesses.
19. Protein fever.
20. Deafness.
21. Mastoid fistula through bony wall of meatus.
22. Recurrence of mastoid infection.

Postoperative Sinus Thrombosis. Hans Brunner[6] has made an attempt to differentiate the clinical course of latent sinus thrombosis from that of postoperative sinus thrombosis. The following means of differentiation were found:

(6) Arch. Otolaryng., September, 1929.

1. Latent sinus thrombosis is found more often in persons with acute otitis, while postoperative sinus thrombosis occurs more frequently in those with chronic otitis.

2. In latent sinus thrombosis, the "Komplikationszacke" (high temperature complication) appears immediately after the operation on the bone. In postoperative sinus thrombosis the interval is longer, usually about two weeks, after the operation on the bone.

3. In latent sinus thrombosis, one finds most extensive local thrombi; in postoperative sinus thrombosis, if one operates immediately after the appearance of the "Komplikationszacke," mostly mural thrombi are found.

4. The prognosis in latent sinus thrombosis is good, if the operation has been sufficiently radical. The prognosis in postoperative sinus thrombosis is unfavorable.

5. Postoperative sinus thrombosis occurs more often than one generally expects.

6. There are different causes for the development of postoperative sinus thrombosis. First is the virulent infection of the wound; hence, the exposure of the sinus is of less importance.

7. The interval before the appearance of the "Komplikationszacke" is usually about a week, especially if the postoperative sinus thrombosis is produced by injury of the sinus wall; in connection with this may be mentioned the fact that sinus thrombosis caused by spontaneous opening of the sinus—apparently because of hemorrhage from the sinus—requires a longer time to develop than that produced by simple exposure of the sinus wall. If postoperative sinus thrombosis is produced by a previous infection of the wound the interval is usually about two weeks.

Sigmoid Sinus Thrombosis. According to G. B. Trible[7] the symptoms found in typical cases are very striking and render the question of diagnosis relatively simple, with an accurate history and accurate temperature

(7) Laryngoscope, July, 1929.

records. The mere presence of a perisinus abscess previous to invasion of the sinus itself does not give any such picture and is usually found only in the performing of the routine mastoid operation, while the lateral sinus thrombosis can be suspected early after its onset, though in the presence of a bilateral middle ear suppuration of equal gravity, so far as mastoid complications are concerned, the question of lateralization is rather a difficult one. The symptoms of the typical case are usually that of the ordinary suppurative otitis media or mastoiditis, which suddenly begins to run a wild temperature chart, chills, accompanied or followed by rapid rises of temperature, with excessive sweating, after which the patient appears very comfortable, and without any relation to the time of day. These symptoms are repeated in cycles and are simulated only by a pyelitis, which may be a complicating factor in female children, and makes for a great deal of obscurity in the diagnosis.

The occurrence of a leukocytosis or a change in the differential white blood count cannot be relied upon, though in the main there is a marked leukocytosis with a preponderantly large poly count. The symptoms recorded by the older texts, such as stiffness of the neck, localized pain or swelling over the line of the vessels, are not dependable. It is more frequently found to be the case that there is a localized tenderness well removed from the canal in the cases presenting perisinus abscess, rather than in the cases with a simple sinus thrombosis. It is questionable whether there is much more stiffness of the neck, except in a very advanced case, than could be accounted for by the underlying disease itself. Eye symptoms are usually those of toxemia, unless there is cavernous sinus involvement, and rarely do we find a Gradenigo syndrome.

The tests by compression of the jugular in determining the presence or absence of a spinal canal obstruction is of doubtful value in the opinions of most of the

writers. It is, or at least was, advocated by Lyman, of St. Louis, or one of its modifications; but Brunner, of Vienna, expressing the views of his school in his lectures in this country, did not consider it reliable as a means of determining which of the two sides was affected in cases of double suppurative otitis media. It involves a lumbar puncture and a recording of the spinal fluid pressure and is made by applying digital pressure anterior to the upper portion of the sternocleidomastoid muscle on the side opposite the suspected thrombosis. If there is immediate rise in spinal fluid pressure, it is reasonable to conclude that the circulation in the jugular or lateral sinus on the opposite side is obstructed. If there be no rise in pressure, an occlusion of the suspected vessel cannot be present. It is evident that the disturbance of the circulation by pressure or manipulation around partially obstructed vessels would probably promote the breaking loose of emboli, or the taking up into the circulation of infectious organisms and bringing about the condition which we are endeavoring to prevent. By the same token, the disturbance of spinal fluid pressure would promote a circulation of the cerebrospinal fluid and give a possible extension from a circumscribed serous meningitis, which is Nature's protection, into a generalized purulent one.

The gross pathology of such a condition may vary markedly; infection and invasion around the wall of the sinus may have existed so long that the walls of the sinuses are covered with greenish or grayish granulations, and yet there be a perfectly patent lumen, with no indication of even a parietal thrombus, while another case may present a dark blue, shining wall, with no evidence of invasion and yet be completely filled by a coagulum. Naturally a direct invasion into the blood stream and a septicemia may exist with no gross vein pathology.

The pressure is low in the sinus and the current of blood very slight and slow, especially around the peri-

phery. Infection around the vessel wall may extend directly through the various layers, starting as a periphlebitis, until a true phlebitis has resulted, with an involvement of the intima and bacterial invasions of the blood stream. A parietal or lining clot only may form, or the entire lumen may become occluded and the sinus thrombus extend upward into the torcular herophili and downward to the subclavian vein, involving the communicating sinuses as well. Usually, however, the clot is much more limited, and may break down and liquify with a perfectly intact limiting wall of clot, protecting the rest of the circulatory apparatus. Intact bone, so far as gross pathology is concerned, may be found between the mastoid antrum and the lateral sinus, and yet a large amount of destruction in the vein be present.

The complications caused by this condition may be divided into the immediate or local, which are, of course, meningitis, extradural or subdural abscess, particularly cerebellar, or only minor complications, such as bone necrosis, involvement of the cranial nerves by extension, and symptoms due to interference with the circulatory apparatus. The remote complications are the ones we would expect from such an invasion of vessels by infection anywhere else in the body, such as bacteremia or pyemia. The infecting organism is not constantly the streptococcus of various strains; sometimes there are hemolytic staphylococci or pneumococci; in fact, several organisms have been found.

Several authors have noted the recanulization of the vein; and restoration of the circulation has been reported, and this may take place in a clot down to the jugular bulb. Personal experience has shown that on palpation of a thrombotic sinus no pulsation can be found as a rule, but the French schools report exactly the opposite.

The question of the proper operative procedure is one about which there is considerable difference of opinion.

The Bordeaux school does not favor the systematic ligation of the internal jugular vein, feeling that the advantages of this ligation are an illusion. They do not feel that it cuts down hemorrhages or that it prevents the diffusion of infection, though admitting that the thrombotic vessel logically drains the area into the jugular, but claim that at the base of the skull there is a confluent vein which is important for its relationship with both the lateral sinus and internal jugular, and external or posterior jugular as well, and this is not blocked. There is one complication that might be mentioned as occurring in an exposed lateral sinus which becomes secondarily infected and breaks down, and that is the possibility of secondary hemorrhage.

The operative procedures in vogue on the Continent, with the exception of the Bordeaux school, seems to be very much more radical than the ones here considered good surgery. They consist of removal of the infected thrombus until there is free bleeding in the wound and complete thrombectomy performed. The mortality is said to be only half as great as in partial thrombectomy.

Scalp Tenderness as an Indication of Dural Involvement in Mastoiditis. When examining cases of acute mastoid disease O. J. Dixon[8] frequently finds tenderness of the scalp the patient's chief complaint.

Failure to elicit cause for this complaint outside the affected ear, and prompt relief following mastoidectomy and exposure of the dura, has prompted the author to investigate each case of mastoiditis, prior to operation, for scalp tenderness. When present he has been able to reproduce this symptom of dural irritation by packing snugly against the dura following operation. Aside from the clinical interest, the symptom has proven of value in several ways.

First, as an indication for exposure of the dura of the middle fossa at the operation.

(8) Ann. Otol. Rhin. & Laryng., December, 1928.

Second, assistance in selecting the most extensively involved ear in bilateral mastoiditis.

Third, as an additional indication for mastoidectomy.

Fourth, the diagnosis and drainage of an extradural abscess and possibly the prevention of this complication.

In addition to the scalp tenderness, which is unilateral, there is usually a complaint of shooting pains in the eye on the corresponding side of the head, and sharp, intermittent shooting pains deep within the ear. The patient is always able to differentiate these pains from those associated with the otitis media. These patients usually are quite nervous, sleep poorly, lose weight, have a poor appetite and run a normal temperature. The hemoglobin drops 20 to 30 per cent, and they have a leukocytosis of 10,000 to 13,000. There may or may not be an increase in localized mastoid tenderness.

The ear findings in most cases are no different from those of an ordinary acute suppurative otitis media. The history nearly always elicits a stormy siege of otitis with delayed middle ear drainage by spontaneous drum rupture which gives little relief.

When these patients come to operation his attention is directed to the marked zygomatic destruction and extensive involvement upward and forward from the antrum extending into and involving the dura of the middle fossa.

Dural involvement is more frequently met with in adults, particularly those of 50 years of age or over, with a thick, tough drum, a hard, dense cortex and an adherent periosteum, through which it is difficult to establish spontaneous drainage. Patients with dural involvement are also more difficult to anesthetize.

Acute Purulent Meningitis of Aural Origin. In this article J. P. Stewart[9] reviews 114 cases of acute purulent meningitis following middle ear disease. In 69 per cent the condition followed the chronic type and in 31

(9) J. Laryng. & Otol., April, 1929.

per cent the acute type of suppurative otitis media. The most common organism was the streptococcus. In 92 per cent of the cases bacteria were found in the fluid obtained by spinal puncture. The diagnosis was based on the general appearance of the patient and his early uneasiness, the temperature and pulse chart, the physical findings, and the findings of examination of the spinal fluid. The treatment consisted in operation supplemented by chemical therapy. While many drugs have proved ineffective, the author has found the daily intravenous injection of 50 c.c. of a 10 per cent sodium chlorid solution of value. Drainage is established most satisfactorily through the internal auditory meatus. When continuous drainage is not employed, frequent lumbar puncture is sound treatment. Of the 114 patients whose cases are reviewed, 8 recovered.

Otitic Meningitis: Its Morbid Anatomy, Prevention and Early Diagnosis. E. D. Davis[1] believes that because of the passage of nerves and vessels through the petrous bone, otitic meningitis is usually basal and the suppuration is found in the basal cisternae and posterior fossa. Persistence of pain, headache, and fever after a mastoid operation requires careful investigation. Reopening of the mastoid may be necessary as unopened deep retrofacial or zygomatic cells may contain pus. In some cases, a lateral sinus infection or thrombosis may be the source of the infection. When such infection is found, drainage must be established through the labyrinth or the posterior fossa, depending upon the line of the infection. The cerebrospinal fluid should always be examined when the slightest suspicion of an intracranial infection arises. The author has never regretted early drainage of the meninges. He believes that the same success should be obtained in the surgery of the meninges as is now obtained from prompt treatment in general peritonitis.

Some Points in the Treatment of Meningitis. G. J.

(1) J. Laryng. & Otol., April, 1929.

Jenkins[2] discusses: (1) a method of washing out the subarachnoid space in cases of septic meningitis secondary to infection of the ear; (2) the importance of maintaining positive pressure of the cerebrospinal fluid when operating on a septic region communicating with the subarachnoid space; and (3) the operative treatment indicated when cerebrospinal fluid is leaking from the region of the ear.

After doing a lumbar puncture and performing the superior and inferior labyrinthotomy operations, the author makes an opening into the internal auditory meatus. When the flow of fluid has been established, he runs a modified Locke's solution and especially prepared iodoform through the lumbar puncture needle. To stop late leakage of the cerebrospinal fluid from the region of the ear he performs a plastic operation, placing over the leak a large flap of the temporal and sternomastoid muscles.

Neuro-Surgical Treatment of Brain Abscess. J. E. King[3] again advises the following:

1. The exact localization of the abscess be made by the use of a brain cannula through a trephine opening.
2. The trephine opening should then be enlarged so that it corresponds in position, size and location with the abscess cavity, *i.e.*, the opening should be so enlarged that it is directly over the abscess.
3. Complete herniation of the abscess cavity so that no drains are required.
4. Dakinization of the area until the hernia cerebri has subsided.
5. Epithelization of the area.

In dealing with brain abscess one should consider the case as one in which there is the faintest possibility of saving life and completely disregard statistics, *i.e.*, one must take the bad with the good and operate upon any type of abscess in which there is the slightest chance

(2) J. Laryng. & Otol., April, 1929.
(3) Laryngoscope, April, 1929.

of recovery. Those cases, in which there is a concomitant, severe meningitis, are poor risks. It is believed that a higher percentage of recovery would follow a delayed operation than one which is immediately done during the severe meningitis. All cases of encapsulated brain abscess evidently went through the period of more or less severe meningitis and were able to weather the storm until encapsulation could take place.

Six cases operated upon by this method have recovered, the first one having been done in 1920. Several other unfavorable cases have died. Two cases died due to the late operation on the frontal sinus, which operation should have been performed sooner. Two additional cases are reported: One of a frontal lobe abscess, and the other temporo-sphenoidal lobe abscess.

The Internal Ear

The Bony Labyrinth of the New-Born Infant and of the Adult. In a comparison of the ear of a new-born child with that of an adult made by G. E. Temble[4], he found that certain parts differ greatly in the two cases, while others are nearly identical, for the growth of the various parts of the ear is not uniform, some not being fully formed until after puberty, while others attain their adult size and form by the end of fetal life. To the latter category belong the internal ear, the tympanic cavity with its auditory ossicles and the mastoid antrum; to the former, the external auditory meatus, the eustachian tube and the mastoid portion of the temporal bone.

He summarizes his investigations as follows:

1. The bony labyrinth of the new-born infant is practically the same size as that of the adult.

2. There is a slight increase in size in some of the

(4) Arch. Otolaryng., February, 1929.

measurements owing to growth, which is most marked in the semicircular canals.

3. The increase in length of the canals is greatest in the external, less in the posterior, and least in the superior canal.

4. The posterior semicircular canal is the longest and the external canal the shortest in both the new-born infant and the adult.

5. The diameter of the posterior canal itself at the vertex is the greatest, and that of the superior canal the least.

6. A small cochlea may be associated with large canals or a large cochlea with the small canals.

7. The semicircular canals in the human are not regularly curved but show at times definite angles, which are sometimes well seen in the posterior canal.

8. Finally, the plane of each of the three canals is not the same throughout its course. Each canal seems to be twisted on its axis, this condition being most marked in the superior canal.

The Ossification of the Labyrinthine Capsule. This report by T. Bast[5] is based on the study of serial sections of the otic capsules of 25 human fetuses, ranging from 100 m.m. to 360 m.m. crown-rump length, and on the reconstruction of five of them.

The labyrinthine capsule is cartilaginous up to about the sixteenth week in intra-uterine life. The earliest ossification centres begin in fetuses of about 120 m.m. crown-rump length. The first centre develops in the region of the beginning of the first turn of the cochlea anteroventral and medial to the round window. This bone appears to protect the organ of Corti in the oldest part of the cochlear duct. The second centre guards the region of the crista ampullaris of the posterior semicircular canal ampulla. The third centre guards the cristae ampullaris of the superior and lateral canal ampullae. A fourth but minor centre develops between

(5) Laryngoscope, October, 1928.

the first two centres, thus uniting them above the round window. The order of appearance of the succeeding centres does not seem to be uniform. Thus in a fetus of 140 m.m. Centre No. 5, which forms the bone of the lateral wall of the internal auditory meatus, is prominent and has just united with Centre No. 3. In another fetus of 147 m.m. an equally prominent Centre No. 6 lies in the medial wall of the internal meatus and is fused with equally prominent Centre No. 7, guarding the entrance of the cochlear nerve into the cochlea. These two centres are not present in the 140 m.m. fetus. In the fetus of 147 m.m. Centres Nos. 6 and 5 are fused to form the roof of the internal auditory meatus. In this same embryo five other centres are present. One, No. 8, in the inferior medial wall of the internal meatus, which later fuses with Centres Nos. 6 and 7 to complete the medial wall of the meatus, and still later with Centres Nos. 2 and 5 to form the floor of the internal auditory meatus. Another centre, No. 9, occurs in the capsule of the most posterior portion of the superior canal just above the endolymphatic sac. Another prominent centre, No. 10, lies in the superior medial portion of the capsule of the first turn of the cochlea. The other two, Nos. 11 and 12, are very small and lie in the lateral and superior lateral portion of the capsule around the first turn of the cochlea. In a fetus of 183 m.m., another centre, No. 13, is started in the capsule over the most lateral portion of the posterior canal. This centre is well developed in a fetus of 190 m.m. The lateral part of the lateral canal capsule is the last of the canilcular capsule to ossify. In an embryo of 202 m.m. there is a mass of bone in this area, but it is continuous with the rest of the ossified capsule and it is thus impossible to determine from the material at hand whether or not this arises as a separate center. The ossification of the canalicular portion of the capsule is completed by the seventh month of intrauterine life. The last portions of the capsule to ossify are the area

around the footplate of the stapes and an area anteromedial to the stapes surrounding Cozzolino's zone, or also known as the fissura anterior. This is incompletely accomplished by the fusion of Centres Nos. 1 and 3, but not until after birth.

The relatively late ossification of the canalicular portion of the capsule can be explained by the fact that the semicircular canals continue to expand after the rest of the labyrinth has stopped growth. The bony capsule develops around the canals as soon as growth ceases.

The much later ossification of the area around and anterior to the stapes cannot be explained on a growth basis. Histological examination shows that the cartilage anterior to the stapes, which is so slow to ossify, surrounds a sac-like fissure which communicates between the middle ear and the perilymphatic space at the point where the scala vetibule joins the vestibule. This fissure has been variously termed fissura anterior or Cozzolino's zone.

The Clinical Significance of Spontaneous Nystagmus. Hans Brunner[6] states that the differential diagnosis between labyrinthine and nonlabyrinthine nystagmus cannot always be arrived at; nevertheless, in the great majority of cases this differential diagnosis can be successfully made, and for this purpose the following points are utilized:

1. Dizziness.—Labyrinthine nystagmus is always accompanied by labyrinthine dizziness (turning dizziness, tactile dizziness)—nonlabyrinthine nystagmus may be accompanied by dizziness; however, it is not of labyrinthine character.

2. Association of Eye Movements.—Spontaneous labyrinthine nystagmus always exhibits associated eye movements. This applies as well in those cases in which paralysis of the eye muscle and spontaneous labyrinthine nystagmus appear simultaneously. When,

(6) Arch. Otolaryng., January, 1929.

therefore, spontaneous nystagmus shows dissociated eye movements, one may be sure it is of nonlabyrinthine origin.

3. Form of Nystagmus.—Spontaneous labyrinthine nystagmus, in its typical form, is combined horizontal and rotatory, or only rotatory. Diagonal spontaneous nystagmus is practically always, and vertical spontaneous nystagmus is often, of nonlabyrinthine origin. However, if vertical nystagmus is accompanied by labyrinthine dizziness, it is of labyrinthine origin.

4. Inversion of Experimental Optical Nystagmus (Barany, Brunner).—The author investigates optical nystagmus by means of the revolving umbrella or Brunner. This apparatus consists of a paper cylinder having a height of 30 cm. and a diameter of 70 cm. On the inner surface of this cylinder are six vertical black stripes which occur at intervals of 30 cm. The cylinder is suspended and the patient is seated within its circle. The lower border of the umbrella should lie approximately on a level with the superior orbital border. The patient is told to look at the black stripes while the observer faces the patient and revolves the umbrella slowly with his right hand.

If one examines a normal person with this apparatus, coarse horizontal nystagmus to the left is observed when the umbrella is turned to the right, and vice versa. If one then examines a patient who has spontaneous labyrinthine nystagmus, the results are the same as those obtained in a normal person. In other words, the spontaneous labyrinthine nystagmus is suppressed by the experimental optical nystagmus. If now one subjects a patient with spontaneous nonlabyrinthine nystagmus to this test, abnormalities are seen in the experimental optical nystagmus, these being grouped under the term "inversion of experimental optical nystagmus." They may manifest themselves as nystagmus in the same direction in which the umbrella is being turned (nystagmus to the right on turning the umbrella to the right,

and vice versa), or as a complete absence of nystagmus, or as nystagmus that appears normal but is of slow movement.

1. In peripheral labyrinthine nystagmus one finds, as a rule, that the intensity of the nystagmus conforms directly to the intensity of the dizziness. In central labyrinthine nystagmus this conformity may be wanting.

2. In peripheral labyrinthine nystagmus the patient falls, as a rule, in the direction of the slow component of the nystagmus, and this falling reaction is often dependent on the position of the head. In central labyrinthine nystagmus the patient may fall in the direction of the quick component of the nystagmus, and this falling reaction is, as a rule, independent of the position of the head.

3. As a last aid one has the combination of nystagmus with paralysis of the recurrent laryngeal nerve. This syndrome is explainable as follows: In the medulla oblongata the fibers of the vagus are in the immediate vicinity of the nuclei of the labyrinth nerve. Therefore, when these nuclei are affected by disease, it is usual for the vagus to become involved through extension of the process. Disease of the nuclei of the labyrinth nerve produces, aside from other symptoms, either nystagmus to the diseased side, or nystagmus to both sides, the condition being more marked to the diseased side. Disease of the vagus fibers produces, aside from other symptoms, a paralysis of the recurrent laryngeal nerve on the diseased side. Thus, there is a syndrome, which is characterized by a nystagmus to the diseased side and a "recurrent" paralysis on the diseased side.

Vertigo as a Symptom. Vertigo as a symptom is of interest to every physician. It occurs in the symptomatology, according to H. Moulton[7], of a vast number of diseases. It varies in intensity but often is of such a degree as to be not only terrifying but incapacitating.

(7) Ann. Otol. Rhin. & Laryng., March, 1929.

The victim demands relief. The physician has a great mystery to solve.

We perhaps should first inquire just what is meant by vertigo. The average patient finds it difficult to describe accurately his symptoms. A feeling of faintness or nausea, a transient hemianopsia or any nerve upset may be called vertigo. But etymologically and in the sense generally accepted by modern writers, and for the purposes of this discussion, vertigo of a rotatory type is meant—that is, the patient experiences a sensation of turning, applied either to himself or to objects about him.

The next problem is to locate the cause. If there are associated symptoms, these may help to solve the problem. If there are none, the mystery is greater.

The causes of vertigo may be divided as follows: (1) Eye disorders. (2) Ear Disease. (3) Intracranial disease. (4) Remote disorders and systemic and metabolic disturbances affecting the labyrinth of the ear.

Gross disease of the labyrinth can also occur without preexisting disease of any other part of the ear, as in Ménière's disease, syphilis, leukemia, etc. Usually all these cases are accompanied by more or less deafness and nystagmus.

Hence every case of vertigo should have a complete ear examination, including testing of audition, and usually turning tests, the douche, and sometimes the fistula tests.

In chronic suppuration of the middle ear, vertigo becomes of great diagnostic and prognostic importance, as indicating the necessity of surgery. But one should endeavor to distinguish between irritation of or extension to the labyrinth and extension of the suppuration to the brain.

While local lesions of the labyrinth produce vertigo, it is equally true that any interference in the tracts through which impulses from the labyrinth pass may produce vertigo. Lesions of the pons, the medulla, the

cerebellum and its peduncles, and of the eighth nerve itself may involve these pathways. As the auditory nerve passes through the pons and approaches the restiform body it divides, the acoustic bundle passing to the outer side and the vestibular bundle to the inner side of this body. Thus a lesion in this region might involve the vestibular portion producing vertigo and nystagmus, without involving the acoustic portion and the function of audition. Even lesions of the frontal lobe produce true vertigo sometimes when they involve tracts leading to and from nuclei at the base of the brain, connected with the vestibular neurons. Lesions of the cerebellum through which most of the vestibular impulses pass to the muscular system of the body are most likely to produce incoordination, vertigo, nystagmus and past pointing of a more persistent type than the vertigo of labyrinthine origin.

Tumor, abscess, hemorrhage and meningitis are some of the conditions that may interfere with the tracts or cause hypertension. With the vertigo are associated usually, if not constantly, other symptoms which must be interpreted by a competent neurologist. Multiple sclerosis is often associated with vertigo by causing degeneration of the nuclei or tracts which convey vestibular impulses.

In addition to cases of vertigo occurring in demonstrable lesions affecting directly the vestibular apparatus or the neurons distributing its impulses, there is a large number of other cases in which no local lesion can be identified. These are the so-called cases of functional vertigo. They may be mild or severe, temporary or prolonged. Lesions remote from the ear and many systemic conditions are able to affect the labyrinth and cause vertigo. The mode of action may be through the reflexes or due to toxins or circulatory disturbances.

If of a reflex type, as in abdominal disease, it is through the sympathetic nervous system affecting the vasomotor supply of one labyrinth or its connections on

one side more than the other. Similar one-sided reflex effects are seen in one-sided pallor, in perspiration of one side of the body and in blanching of one cerebral occipital lobe in transient hemianopsia, etc. Vertigo in diseases of the upper respiratory tract is usually due to a direct extension of the disease to the middle ear involving the labyrinth secondarily. But in a reflex way through the vasomotor nerves disease of the nasal accessory sinuses can produce vertigo without producing demonstrable middle ear disease.

Vertigo in cardiovascular disease is due to insufficiency of blood supply to the brain and labyrinth. Such diseases are aortic valve lesions, thoracic aneurysm, heart block, auricular fibrillation, etc. Low blood pressure will produce vertigo. It is common in high blood pressure, especially if the pressure is suddenly lowered. The changes in the labyrinth brought about in these conditions are probably due to changes in pressure of the intracranial contents on the saccus endolymphaticus.

Toxemia causes vertigo through irritation by the poison of the nerve endings in the labyrinth and vestibule. Certain drugs and endogenous poisons, such as are retained in the system in cases of renal insufficiency, etc., are in this way responsible. Endocrine disorders have vertigo as a symptom in about 25 per cent of the cases. These disorders produce changes in blood pressure and in intracranial and labyrinthine tension. They influence metabolic processes so that a toxin or too much or too little of some normal blood constituent reaches the labyrinth and causes irritation and vertigo. The nerve elements within the labyrinth, like the retina of the eye, are very delicate and easily disturbed by the slightest of influences.

It may be said that these general conditions are outside the domain of otology, but as all cases of vertigo, excepting ocular vertigo, are now held to have their immediate cause in disturbance of the semicircular canals or their connecting neurons, the otologist is called

upon more and more to aid in tracing out their etiology. He can do this with more satisfaction to himself, the patient and the physician who asks his aid if he is familiar with all possible etiologic factors and their modus operandi. It may be that many of us have regarded this symptom too lightly in the past, especially in its most obscure phases. If so, it is hoped this superficial review may stimulate more general research in this important field. The most difficult cases to deal with in practice are those in which no fault can be found in any part of the ear.

Vertigo From Impacted Teeth. H. B. Anderson[8] reports two cases. One of the patients had impacted upper right, upper left, and lower right third molars. The other had a badly impacted lower left third molar lying deeply imbedded. These impacted teeth were removed and neither patient has since then had an attack of vertigo. The author offers an explanation for the association of impacted teeth and vertigo. The impacted tooth presses on the dental branches of the fifth nerve. This pressure or irritation sets up impulses that travel back to the nucleus of the fifth nerve. From there, by diffusion, they reach the nucleus of the eighth nerve, and from there they go to the labyrinth or the cerebellum. Disturbances in the latter structures are a recognized cause of vertigo.

Response of Vestibular Apparatus to Drugs. This work by E. L. Ross is quoted under Society Transactions[9]. In order that the results might be most directly applicable to medical practice, mutilating operations, employment of lower forms of animal life and unphysiologic methods of stimulation were avoided as much as possible. Dogs were used as subjects. No operations were performed. The method of stimulation was rotation, with the dog's nose in the vertical plane; the duration of nystagmus was taken as the measure of the degree of stimulation. The dog was tightly tied to a

(8) Pennsylvania M. J., April, 1929.
(9) Arch. Otolaryng., June, 1929.

specially constructed board, so that no part of the body could change position. A large leather muzzle, fitted with a 20 diopter lens, was placed on the dog's head in such a way that one eye was covered with leather and the other with the lens. The board was then attached to a vertical bar which, by means of an electric motor, was rotated at a constant rate of about 35 turns per minute. From a series of tests, we decided that rotation for fifteen seconds, with a sudden stop, produced a vestibular stimulation which was not maximum and still large enough to allow a considerable diminution. After the sudden stoppage of the dose of rotation, the duration of nystagmus was timed with a stop watch. The interval between tests was always five minutes. Usually three tests were made before the drug was administered. The drug was always injected intraperitoneally. Two minutes after the drug was given, the next test of rotation was made. The tests were continued for about an hour after the administration of the drug.

Four drugs altered the vestibular reaction. Epinephrin increased it, while sodium nitrite, cocain and pilocarpin decreased it. Why epinephrin should increase vestibular reaction cannot at present be proved. The primary action of this drug is to stimulate the endings of the thoracolumbar sympathetic nerves. A great many physiologic changes take place as a result of such stimulation. One of the most marked changes is the quick rise of blood pressure. The fact that sodium nitrite reduces blood pressure and in the author's group of animals reduced labyrinthine reaction argues in favor of blood pressure being an influential factor in vestibular irritability. Cocain and nicotin both stimulate the thoracolumbar sympathetic system but not so violently as epinephrin. In addition, there are many side actions such as anesthesia and ganglian depression. Both drugs increase blood pressure but not as violently as epinephrin. The lack of influence of nicotin on vestibular

reaction is evidence favoring the view that no sympathetic ganglion is involved in the reaction of the vestibular apparatus to rotation. If the vestibular nerve had any of the properties of the craniosacral sympathetic nerve, it would be depressed by atropin and stimulated by pilocarpin. The author's results show no action on the part of atropin, and a depression instead of a stimulation by pilocarpin.

Therefore, the data leads to the conclusion that the vestibular nerve has no properties of the craniosacral sympathetic nerves. The depression produced by pilocarpin was probably due to one or both of two results of its administration. The dose of pilocarpin was large, and produced marked diarrhea and general depression. Possibly, there was considerable reduction in blood pressure as a result of the decrease in heart rate and loss of body fluids through the diarrhea. While none of the animals died, the general depression was great. This alone is sufficient to reduce the reaction of the vestibular apparatus to stimulation. This the author considers the most influential factor, if not the only one, in the reduction of vestibular reaction by both cocain and pilocarpin. Further work is being done on the effect of drugs on the vestibular mechanism.

The Certain Proof of Vasoconstrictor Processes of the Auditory Artery During the Caloric Irritation of the Labyrinth. O. Muck[1] has repeatedly pointed out that the epinephrin-probe tests shows the tonus of the innervation of the vessels of the brain. This nasal vasomotor reflex phenomenon, the so-called white streak design, demonstrates the hyperirritation of the vessels of the brain. The author could show that in this instance a hyperexcitability existed of those parts of the sympathetic nervous system which innervate the vessels of the brain, while all vessels react with vasoconstriction on irritation of the sympathetic system. This reflex phenomenon was found invariably in migraine, hemi-

(1) Ztschr. f. Hals- Nasen-u. Ohrenh., Feb. 16, 1929.

crania sympathicotonica. The author has made 15,000 investigations since 1922 and found that the phenomenon also occurs in the so-called Ménière's complex of symptoms. He states that this proves that vasomotor disturbances in the innervation of the brain vessels, especially of the internal auditory artery, play an important part, and that they are, probably, the exciting element in the so-called Ménière's disease. The internal auditory artery is an end-artery and serves the whole membranous labyrinth.

The author drew the conclusion that the validity of the angioneurotic theory could be proved if his phenomenon, the epinephrin-probe reaction, could be produced in the healthy person after caloric irritation of the vestibular apparatus, provided a normal reaction was present before the caloric test. Repeated examinations proved the theory to be correct. Besides the vestibular nystagmus, the white streak design was always present. This also proves the correctness of Kobrak's vascular nystagmus theory. Further experiments had been made on a number of people with complete unilateral deafness and on deaf-mutes. If in patients with complete unilateral deafness and in deaf-mutes nystagmus could not be elicited, the vasoconstrictor nasal reflex phenomenon was also absent. The author again calls attention to his test with a few words. If the noninflamed mucous membrane of the nasal turbinal is sprayed with a solution of epinephin hydrochlorid 1:1,000 until a slight ischemia results, and if the mucous membrane of the lower turbinate is stroked several times on the same spot with a blunt probe, a reflex dilatation of the vessels occurs, as a rule. It can disappear quickly or it can last for several minutes (normal reaction). In diseased conditions (endocranial vessel sympathicohypertonia), after one or two minutes, and lasting longer, a sharply defined white streak or speck appears, when the epinephrin ischemia of the untouched mucous membrane begins to disappear.

The author concludes: 1. If the labyrinth can be irritated calorically, greatly or slightly, the nasal vasoconstrictor phenomenon appears plainly. The white streak design is the symptom of an increased irritability of the vessels of the brain, in this instance of the auditor artery (experimentally induced angiospasm of the auditory artery). 2. In complete unilateral deafness, with a calorically unexcitable labyrinth, the white streak design is absent. 3. In complete deafness, especially in congenital deaf-mutism with calorically responsive nystagmus, the white streak design is present. 4. If the labyrinth of the deaf-mute does not respond to the caloric test, the vasoconstrictor phenomenon of the white streak is not present when the labyrinth is irritated calorically.

Neurolabyrinthitis of Focal Infection Origin. In reporting an illustrative case G. W. Mackenzie[2] states that he is inclined to believe that what appears to be an elective affinity of certain strains of streptococci for a particular organ or tissue is nothing more than an increased susceptibility of that organ to the bacterial toxin. Furthermore, if the secondary manifestations are due to the actual presence of the streptococcus, for instance in the inner ear, how could their elimination at the primary focus wipe out their presence in the ear and bring about such rapid and marked improvements in the hearing and labyrinthine functions, so often observed in this class of cases.

Focal infection neurolabyrinthitis presents clinically both general and local symptoms. The general symptoms are due to the wide-spread diffusion of the bacterial toxins generated at the primary focus; whilst the local symptoms are those referred to the inner ear and eighth nerve, because of the selective action of the bacterial toxins for those structures. Among the more general manifestations of focal infection may be mentioned a general depression of health, lowering of the

(2) Laryngoscope, May, 1929.

blood pressure, lack of "pep," or ambition, pallor of the face, the result of the diminution of hemoglobin and of red blood cells, relative lymphocytosis, rheumatoid pains in different parts of the body, vague gastro-intestinal symptoms and other rather indefinite symptoms. Indefinite because the pathologic-anatomic changes responsible for them are not sufficiently well developed to produce more definite symptoms. The local manifestations referable to the ear, on the contrary, are quite definite. They include deafness of the perceptive type, indicated by a diminution of the hearing function to both air and bone conduction for all pitches, including the high tones, and a diminution of the labyrinthine function, indicated by the presence of spontaneous nystagmus directed away from the affected side, diminution of the after-turning nystagmus toward both sides, particularly the affected side, and diminution of the electrical reaction on the same side.

Although neurolabyrinthitis of focal infection origin tends to be unilateral, involving both the hearing and the labyrinthine functions, cases are found in which the hearing function suffers more than the labyrinthine, and other cases in which the labyrinthine function suffers. The surest way to establish the diagnosis is by the therapeutic test. In other words, if a case comes to the physician in which the local and general symptoms speak most strongly for a focal infection neurolabyrinthitis and the eradiction of the suspected focus is followed by very prompt and exceptional improvement without further recurrences, the diagnosis is established as certainly as it is possible to be clinically.

Contribution to the Surgical Indications in Purulent Labyrinthitis and Otitic Meningitis. As a result of their experience with seven cases S. J. Kopetzky and R. Almour[3] believe that:

1. Where a circumscribed purulent labyrinthitis exists, regardless of its extent, no surgery on the labyrinth

(3) Laryngoscope, April, 1929.

is indicated when the spinal fluid shows normal chemical, cytological and bacteriological findings.

2. Where a diffuse serous labyrinthitis exists which is the direct result of a pathological process in the middle ear or mastoid, no surgery on the labyrinth is required.

3. In both the diffuse serous and the circumscribed purulent labyrinthitis, removal of the causative factor is sufficient to result in a cure of the lesions.

4. A diffuse purulent labyrinthitis requires a labyrinthectomy only when the cerebrospinal fluid presents evidence of a threatened invasion of the subarachnoid space. In such cases, surgery on the meninges is also indicated.

5. Otitic meningitis is amenable to surgical treatment in the very early stages of the disease. Surgical measures in these cases must be planned with attention to the type of organism found, the route of infection and the area of the subarachnoid space first involved.

6. The route of infection is an important guide to the prognosis. Where the route leads to the middle cranial fossa, the prognosis is most favorable. Next is the route of infection leading into the lesser cisterns. The infection which takes place through Trautmann's triangle or through the lateral sinus gives the worst prognostic outlook.

When doing the original surgery on the mastoid process, the route of infection should always be noted, in view of the possibility of subsequent endocranial complications. Should such complications supervene, one can utilize the data obtained at the primary operation; for the surgical attack should be made directly on the area of the subarachnoid space first infected.

7. A purulent meningitis in its earlier stages may reveal no organism in the spinal fluid. Consequently, the authors disadvise waiting for the relief of this condition. Operative measures should be instituted very early; and the indication for them should be the clinical

syndrome of meningitis, associated with a purulent spinal fluid.

Miscellaneous Conditions

Contribution to the Study of Chronic Progressive Deafness, with a Plea for a Nation-Wide Investigation. According to T. J. Harris[4] the most important problem today before the otologic world is the cure of progressive deafness. The last fifty years have witnessed remarkable achievements in the cure by surgical measures of acute and chronic suppurative conditions of the ear. Indeed, the history of medicine contains no fairer chapter than that having to do with the surgery of the ear. No corresponding progress has been made in the treatment of chronic nonsuppurative affections. In 1902 the writer called attention, at a meeting of this society, held in Washington, to the impasse existing at that time in the treatment of these conditions. In the intervening years, the situation has remained materially the same. During this time it is true that the pathology of the form of progressive deafness commonly known as otosclerosis has received exhaustive attention, especially on the other side of the water, but so far as a cure for it or for any form of progressive deafness is concerned it cannot be truthfully stated that we have advanced to any considerable degree. More and more it has become apparent that the cure of progressive deafness can never be secured through a knowledge of the pathology alone, and within the last few years it generally has been recognized that the all-essential need was to determine the causative factor or factors. In a number of the leading hospitals and university laboratories on both sides of the water this subject is being carefully studied.

A large number of cases were subjected to the following examination:

(4) Ann. Otol. Rhin. & Laryng., September, 1929.

1. A complete history, including any information obtainable in regard to the onset of the trouble, previous illness and possible hereditary association.

2. A careful inspection of the middle ear, eustachian tube, nose, including the accessory sinuses, throat, tonsils and teeth.

3. Functional tests of the ears, including lower and upper limit, Rinne, Schwabach, Gells, whispered and spoken voice, rotation (in a limited number of cases).

4. Audiogram, taken in a soundproof room.

5. Complete blood chemistry, including calcium, basal metabolism, Wassermann and Kahn.

6. *X*-ray of sella turcica and of nasal accessory sinuses and of teeth in all suspected cases.

7. Eye fields (limited number of cases).

8. Complete physical examination, including blood pressure, in all cases where any general physical abnormality was indicated.

9. Study of endocrine system.

10. A thorough study of every case giving familial history to determine a possible inheritance factor.

Focal Infection.—With Emerson and many others, the author has for a long time been a believer that focal infections, especially those proceeding from the nose and throat, are an important contributing cause in progressive deafness. On that account he paid particular attention in the study of his cases to possible foci of infection. In every case an examination was made of the nose and throat. In many cases *x*-rays were taken of the nasal accessory sinuses. Whenever the condition warranted the case was seen by a member of the throat staff.

He recognizes the possibility of overlooking focal centers in the pressure of the work, but, allowing for a reasonable percentage of error, it is hard to reconcile the results secured. Altogether 14 cases of diseased tonsils and 3 cases of sinusitis (none of the latter pronounced), were found; 2 cases of pyorrhea; 6 cases with

intestinal symptoms, not extensive; 1 case of diabetes, and 6 cases, seemingly the result of an acute toxemia—quinin 1, poliomyelitis 1, typhoid 1, ptomaine poisoning 1, mumps 1, and grippe 1.

The most careful search failed to discover more. Even in the case of the tonsil, a considerable number of cases had had their tonsils removed at the onset of their deafness, without benefit. Indeed, several cases insisted that their hearing had been made worse by the operation.

He does not attempt to explain the variance between these findings and those of Emerson. It seems that while focal infection is undoubtedly the cause, too great importance has been placed upon it.

The problem is a big one, but never was there a time when so much encouragement existed for a successful solution. Progressive deafness does not have in it the appeal to the popular imagination which tuberculosis has, and yet, with three million school children affected to a greater or less degree, as well as millions more of the adult population, with all that it implies of handicaps to the wage earner, no greater boon can be brought to mankind than to secure the knowledge by which deafness can be not cured but prevented.

Chronic Deafness—An Endocrine Study of a Thousand Case Histories. In this article D. Drury[5] presents several illustrative cases under each grouping. In his discussion he states that patients exhibiting thyroid failure are prone to a marked fatiguability which develops with a less than normal expenditure of energy. In this way they resemble the neurasthenic, just as in their somnolency after food, they remind the observer of the lithemic subject. The individual is never fit; he is generally tired and finds work a burden; his concentration is never at its best when faced with a problem; in a word, he is as sluggish mentally as he is languid physically. The reflexes are tardy, but they are always

(5) Laryngoscope, September, 1929.

present. Giddiness is yet another symptom which almost always presents itself at some stage of the disease and with which in some cases is associated a swimming sensation. Tinnitus aurium is common in the form of buzzing, roaring, whistling or shrieking noises; while such patients sometimes experience even more serious sensory disturbances, as the hearing of voices or the ringing of bells.

Myxedema is a frequent finding in thyroid failure, although an amyxedemic type has been described by this institution. The thickening involves the skin and, according to many observers, other tissues as well. The author feels that it is not illogical to explain some of the deafness seen in these cases to a colloidal infiltration. Certainly, treatment with the correct thyroid substance reduces the edema and causes local improvement in the hearing.

Diseases of the pituitary gland present symptoms which are markedly influenced by the time of the appearance of the deficiency in relation to the status of maturity of the individual. The pictures of pre- and post-adolescent failure are well known. With the pituitary as with the thyroid, suitable medication is extremely effective in those cases where careful laboratory and clinical studies have established a definite diagnosis. It is perhaps not too much to say that where organotherapy is administered after the definite establishment of the diagnosis, the use is less speculative than with certain of the simple inorganic remedies, which, in ameliorating one symptom are prone to initiate others. It is a matter of record, further, that in the endocrinopathies a whole host of unusual and even bizarre symptoms may develop which are seemingly wholly unrelated to the primary condition. Correction of the latter, however, by suitable therapy concomitantly rectifies many of the physical and mental deviations which have apparently existed coincidentally with it.

Where a correlation exists between lowered basal

metabolic rates and chronic deafness, it seems most probable that both are results rather than causes. The former indicates a lowered functional activity, a depression of the respiratory exchange, a diminished energic output. Similarly, in patients demonstrating a lowered aural acuity which cannot be traced to a demonstrable infective process, there are likewise observed evidences of a decreased metabolic level. The endocrine glands are among the powerful regulators of the levels of body metabolism. In conditions of functional failure, lowered basal rates are invariably found. Where these are associated with a loss of aural acuity, for which no infective or other direct or mechanical cause can be demonstrated, it has seemed a fair presumption that the hearing failure might equally be a result of lowered metabolism deriving indirectly from the endocrine condition. Experience has shown this to be the case in a very appreciable percentage of true otosclerotics. It follows as a corollary to this postulate that other and nonendocrine agencies producing lowered metabolic levels may equally affect the acuity of hearing as one indirect end-result. It is on this basis that the author has sought to explain those otosclerotics in whom no endocrinopathy was demonstrable.

Deafness and Its Treatment. H. Kisch[6] deals with non-suppurative types of middle ear deafness. There are three clinical groups, but mixed forms may occur: (1) deafness due to the results of attacks of inflammation; (2) deafness due to eustachian and tympanic catarrh; (3) cases of otosclerosis. In the first group the deafness is due to adhesions formed in the middle ear, which obstruct movements of the ossicles. Two extra factors might add to the deafness in this group: (*a*) the functional element, (*b*) a concomitant nasal catarrh due to nasopharyngeal catarrh. The treatment of this group is to prevent the onset of deafness at the time of the acute attack. Massage and inflation are important.

(6) Lancet, May 11, 1929.

If the ossicles are much bound down, massage does not remove the trouble, and the effect of removing the incus should be tried. For this the mastoid route is preferred. The difficulty is to estimate the degree of fixation of the stapes. If it is firmly fixed no improvement in the hearing takes place.

The majority of cases of chronic deafness belong to the second group. Most of them yield to rational treatment. The chief cause is nasopharyngeal catarrh, and great relief ensues from inflation and massage. The nasopharyngeal catarrh is first treated, then local measures applied to the middle ear. In a hospital clinic, observation extending over a large number of cases showed that 95 per cent of adults who had not had their tonsils enucleated possessed septic tonsils. A minute amount of septic tonsil left behind at operation sufficed to cause continued catarrh. Chronic catarrh of the frontal sinus is more frequent than was usually supposed, while in some cases sphenoidal sinus disease is present. Rectification of nasal septum deflection sometimes gives rise to immediate improvement. Simple inflation of the ear is the only local measure required. The author does not favor the use of hot air or vapor for the purpose, and in his hands ionization has not been of value. Diathermy is still on trial; in some cases it helps to dissipate the tinnitus. He questions whether, in a general way, sufficient attention is directed to the prevention of deafness. Every case of catarrh should be looked upon as a potential case of deafness, and steps should be taken to deal with the catarrh, whatever it is due to. Contributory causes, such as a damp house and unsuitable climatic conditions, should be investigated.

W. S. Thacker Neville[6] deals with chronic deafness. In his experience, chronic deafness has been due to chronic suppurative otitis media, chronic catarrhal otitis media, and otosclerosis. The catarrhal form he has treated with the inflation of hot air, by insufflations with

(6) Lancet, May 11, 1929.

oil of turpentine and balsam of Peru, by massage of the tympanic membrane with an electric motor, by diathermy and by ionization. In chronic suppurative otitis media he has safeguarded the hearing with ionization with zinc sulphate. For polypus he has used electrolysis with two needles, and crystals of chromic acid. He has recently used lipiodol as a local application, as it has been shown to enter the mastoid cells via a tympanic perforation. By these measures he has improved hearing without doing a mastoid operation. He is sure that hearing is often improved by removing tonsils and operating on the nose for sinusitis, to remove a septic focus. Until this and such steps as correction of septal deviation to allow of catheterization, removal of adenoids and dental sepsis has been carried out, the physical methods should not be considered. He has successfuly used diathermy according to the technic of Lerroux-Robert, and Hollander and Cottle for what seemed to be hopeless deafness. One electrode is placed on the mastoid, the other on the cheek; this caused a rise of temperature amounting to 2 or 3 degrees in the tympanic cavity within five minutes. Low voltage and low frequency are recommended so as to cause a deeper penetration of heat. This appears to augment the blood-supply to the part and so hastens the absorption of effusions. Lerroux-Robert placed electrodes in the meatus as well as on the mastoid. The latter said that diathermy was indicated in cicatricial otitis following suppuration and in adhesive otitis following an acute catarrhal otitis with calcareous deposits. For chronic deafness, but especially for improving tinnitus, he used the Zund-Burguet apparatus, and ionization with sodium salicylate applied by means of the negative pole.

D. McKenzie[6] gave an account of his experiences with medical diathermy, and the intravenous use of collosol iodin. In the former, the amount of current passing rarely exceeds 500 ma.; only that strength of current is

(6) Lancet, May 11, 1929.

used which causes a comfortable sensation of warmth. It is increased in strength from zero very slowly. The cutaneous sensibility is the safest guide to the temperature of the deeper parts. The heating of the tissues in the path of the current is cumulative. Frequently an increase of the tinnitus is complained of directly after the sitting, but in most cases this was not an unfavorable sign. He gives an analysis of 46 cases which he treated during the last 18 months, most of them being of the dry, progressive, middle ear type. In five of them the deafness and tinnitus disappeared entirely after from two to six sittings. In another series of five great improvement followed the treatment, though they had been mostly long-standing cases — i.e., 2 and 9 months, and 5, 7, and 10 years. In general, 20 per cent of these cases showed improvement. Of the remaining 36, 13 showed temporary improvement, but 21 did not show any, while in 2 the tinnitus was made much louder by the diathermy, and the patients declined to continue. The author advises watching for the onset of a continuance of deafness and tinnitus after colds in the head, influenza, etc., as well as after acute otitis media, and to submit these patients to diathermy in the early weeks of the symptoms. The intravenous injection of massive doses of collosol iodin has been suggested. From 6 to 13 ounces of collosol iodin is run into a vein once a week, as in blood transfusion. No shock, rigor, or pyrexia follow, neither does iodism. Patients can safely be allowed to return home after the injection. An objection to the treatment is that in two or three of the cases coagulation in the veins selected took place immediately after the injection. Until this can be avoided it must check any extensive trial of the remedy. Of the seven cases so treated, two were subsequently treated with diathermy also; one with definite and progressive improvemnet, the other with none. Of the other five, two showed improvement.

Aural Tetanus and Its Relation to Ocular Tetanus.

G. V. Borries[7] has found only nine cases of ear tetanus published, with recovery in five. The disorder occurs after traumas, extensive or slight, and without definitely established traumas in secondary infections of a suppurating middle ear. Postoperative aural tetanus seems to be unknown. Ocular tetanus, while also rare, is apparently more common than auricular tetanus and, like it, may occur after very slight lesions. Ear tetanus is marked by trismus, difficulty in swallowing, and sometimes by involvement of the facialis, in the form of spasm or of paralysis. In eye tetanus involvement of the facialis is more constant. While other nerves may be affected in tetanus of the head, the facialis symptoms are especially noticeable. The author warns that in diseases of the facialis of uncertain cause, tetanus should be borne in mind, even without known trauma.

Unusual Ear Cases: Salivary Fistula of Mastoid Region; Bilateral Cysts of External Auditory Meatus. The first case reported by W. L. Simpson[8] was a young woman, 22 years old, who was first seen with the history of having had a simple mastoid operation on the right ear two years previously. The mastoid wound healed normally, but since the operation there had been a flow of saliva from the lower part of the wound. The flow of saliva was very annoying, especially at meal time. It was necessary to change dressings at frequent intervals on account of the constant flow of saliva. Under gas anesthesia, an incision in the right mastoid wound in the region of the fistula was made. No definite fistula could be followed. A small amount of soft tissue was removed. The soft tissue was closed with catgut; the skin with metal clips. Dressings of moderate pressure were applied. The skin clips were removed on the fifth day. The wound healed without further discharge of saliva.

The second case was a woman, 20 years old, who came to the Clinic, with a history of having had two opera-

(7) Ugesk. f. Laeger., Sept. 13, 1928.
(8) South. M. J., March, 1929.

tions on the left ear for a cystic condition of the external auditory meatus. For one year there had been a mucous discharge from the left mastoid region. At the time of examination there was a dark area in the mastoid region, left side, in which there was a fistula with mucus discharging from it (site of previous incision). A probe could be inserted about one inch superiorly and anteriorly. The *x*-ray showed no involvement of the mastoid bone. There was slight swelling of the external auditory meatus. On August 31, 1926, under local anesthesia with the aid of methylene blue which had been injected into the cyst, the cyst was removed and the wound closed without further trouble.

About six months later, after the author had observed an enlargement of the posterior wall of the external auditory meatus of the opposite ear which had gradually increased in size, he removed a drachm of straw colored fluid from a cavity with a small needle through the external auditory meatus and immediately afterward the sac was filled with methylene blue. The cyst was removed through an incision as in the ordinary mastoid operation. The cyst was easily dissected from the surrounding tissue except anteriorly where it was closely attached to the skin of the meatus. The skin was removed over an area about one-half inch square. To close this opening in the canal a flap of skin was carried forward from the lower part of the mastoid region from the posterior lip of the primary incision and attached to the internal superior and inferior edges of the opening in the external auditory meatus. This flap was left attached at the upper end in its original position. The wound was closed with metal clips. Six days after the removal of the cyst the wound was again opened and the flap cut posteriorly from its attachment to the skin and also cut anteriorly where it had been attached to the opening in the meatus. Three sutures were used at this time to attach the skin to the opening of the meatus externally. An uneventful recovery was made.

Bilateral cyst formation must be due to a congenital condition, as it does not seem possible otherwise that two cysts of identical structure would form simultaneously in the same location. The methylene blue was of considerable aid in outlining the exact extent of the cysts, and facilitated their removal. The cyst of the right meatus was so much a part of the canal that removal of quite a large area of the skin and cartilage was necessitated. The closure of this opening was made possible by the plastic operation described. It seems to the author that a similar flap might be used to advantage in plastic work of the external auditory meatus.

In the case of the salivary fistula of the mastoid, the report is not made on account of any special operative technic, but to emphasize the ease with which the closure was obtained, on account of the rarity of the condition; and to bring out the possibility that this condition may arise after any mastoid operation.

Inner Ear and Cerebellar Changes in Pathologic Fetal Position; Their Significance for Static Disturbances in Earliest Periods of Life and for Some Anomalies of Speech. Six cases with pathological fetal positions were studied by A. Precechtel[9]. In two of them histological changes were found in the inner ear and in the central nervous system; in the third case the changes were in the central nervous system only. In the remaining three cases the brain was not examined, but in two of them changes in the inner ear were found. This makes a total of five cases with pathological findings, out of the six cases under study.

The peripheral changes consisted in a heavy hypotonic degeneration of the neuroepithelium in the cochlea and in the vestibular apparatus. Besides that, in one case there was an extensive primary disturbance of the development of the inner and of the middle ear. The changes were either unilateral or bilateral.

The central changes affected the oblongated medulla,

(9) Laryngoscope, July, 1929.

the middle brain and partially even the hemispheres (hypoplasias, clefts and tectonic disturbances). But the cerebellum was always or the only one which was affected. The changes were variably extensive, but always or even exclusively the lesion was found in the lingula.

These findings can form a pathologico-anatomical basis of a clinical syndrome, namely: Pathological fetal position, followed by delayed ability of sitting up, standing or walking of the baby. For the histological changes are found in the very organs regulating the static functions.

The changes in the inner ear explain also the paradoxic reaction (positive after rotation, negative after calorization), concomitant the mentioned syndrome. The irritation caused by the rotary movement is, namely, much more intensive than that caused by calorization. And the sudden jerk of the stopped rotation can produce a reaction on the shrunken cupula, or even on the bare crista without the cupula, which cannot be elicited by the fine current produced by calorization.

The findings mentioned above also correspond very well with two distinct groups of speech disturbances, which very often go with the above syndrome and which were described by Seemann. These are: 1. Speech disturbances of those hard of hearing. 2. Audiomutism, which Seemann already related to the functional disturbances of the cerebellum. The peripheral changes explain the disturbances of speech based on decreased hearing. The changes found in cerebellum are probably the anatomical substrate of the Seemann's hypothesis of the cerebellar origin of the audiomutism. The changes in the lingula are especially suggestive in these speech disorders, for it is an organ which was found by L. Bender to have a relation to the movements of the vocal cords.

Sensory Analysis of Helen Keller: its Bearing on the

Further Development of the Human Brain. F. Tilney[1] states that the human race has in all probability not developed more than one-fifth of its potential brain power. To substantiate this statement he cites the case of Miss Keller, who to all intents and purposes with a single sense has achieved a distinguished place in American civilization. The author has had the privilege of making a personal study of Miss Keller or her psychology and, more particularly, of her sensorial equipment. The problem was chiefly centered on the secret underlying the wonderful intellectual development of this remarkable woman. The author had in mind three scientific questions bearing on this problem: "First, what light does Helen Keller throw on the actual capacities of the human brain? Second, does she reveal the validity of certain principles and methods in education which would tend to improve our present system? Third, does she demonstrate that humanity in general has not yet begun to make the best use of its brain power?"

By means of charts the sense of development was diagrammatically shown. Helen Keller's skeletal and visceral senses are normal. Of the other senses, the olfactory was little if any better in perceiving and discriminating these stimuli than that of the average normal adult. Concerning the sense of sight, a simple statement covers this part of the sensorium, for both retinas are absent, and Miss Keller has no perception of light, object or motion. Her hearing is, of course, entirely absent. Her vestibular mechanism does not respond. With reference to her sense of touch, a few tests were made. Miss Keller's two point discrimination was not any better than that of the normal average adult. Her best two point discrimination is on the tip of the tongue where she has the ability to recognize two points 0.5 mm. apart. She is able to take a needle, put its eye on the tip of her tongue, identify it in this way, and then holding the needle and thread close together, with patient

(1) Laryngoscope, June, 1929.

application, she can actually thread the needle. In the matter of weight discrimination, she is not able to distinguish anything less than 1,000 mg. In focal vibrations measured by means of the pallesthesiometer she corresponds almost absolutely to the normal.

In the various examinations it seems fair to assume that this study has not demonstrated any superiority in Helen Keller's primary perceptive organisms. Whatever she has done in the way of gaining supremacy over the average individual must not, therefore, be attributed to her receptor system. It has all been brought about by the use she has made of her sensory impulses once inside her head, that is, actually in her brain. The secret of her development has been one thing—Practice! Practice! Practice!

Angiospastic Pains in the Ear. The spasms of the arteries in these cases may be of vasomotor or of arteriosclerotic nature, according to C. Stein[2]. The vasomotor disturbances are mostly neurasthenic in origin. Endocrine anomalies also may be a frequent cause. Phenomena of irritation of the sympathetic, such as increased pulse frequency, palpitation, feeling of anxiety, tremor and rise in blood pressure, may accompany the ear pains, especially when these occur in girls and women just before menstruation. Hypertension on a nervous basis was present in a considerable number of the author's patients with angiospastic otalgia. In these cases there was also a sensation of pressure in the regions of the ear and of the heart, weight on the chest and general fatigue, and the otalgia was accompanied by noises in the ear and disturbances of hearing (symptoms of arteriosclerotic disease of the inner ear). In cerebral arteriosclerosis the sensations in the ear are usually unilateral and may be described as pressure, tension or stabbing or spasmodic pains. They may occur several times a day, or days or weeks may intervene between attacks. The attack may last only a few seconds or

(2) Wien. klin. Wchnschr., Oct. 18, 1928.

several minutes, sometimes longer. The pain is usually moderate in intensity, but in one case it was accompanied by such severe pain on pressure as to simulate mastoiditis.

Pain on pressure of this sort may also be the consequence of a myalgia in the region of the head muscles. If this is the case, the insertion of the sternocleiodomastoid to the tip of the mastoid process is tender and the pain radiates into the ear. There may also be tenderness of the musculature of the neck. Glasscheib ascribes such myalgias to angiospastic contractions of the muscle bundles. Angiospastic otalgias may be manifested merely by paresthesias, sensation of cold or heat, or itching. Psychic treatment is of value. Measures to relieve the peripheral vessels and establish a regular circulation in the ear should be undertaken. In cases of arteriosclerotic diseases of the middle ear, theobromin sodiosalicylate (diuretin) may be used with advantage and the nitrites may be employed to lower vasomotor tonus. Good results from diathermy have been noted.

Herpes Zoster in Otolaryngology. W. H. Sears[3] has seen seven cases within four years and believes it is much less rare than is apparent.

The attack may be ushered in by mild prodromal symptoms, with a feeling of malaise for a few days, followed by a slight increase in temperature and a feeling of general discomfort or aching; or the prodromata may be more severe, with a feeling of general illness and severe headache, succeeded sometimes by a violent chill with nausea and vomiting; or there may be no marked initial symptoms, the disease arising suddenly, with or without a chill, and violent pain being the first symptom to appear.

If the geniculate ganglion alone is affected, or is the chief point of attack, the first symptom is usually a severe pain in the ear, which is lancinating, throbbing, or deep aching in type. This preherpetic pain may

(3) Pennsylvania M. J., June, 1929.

reach a high degree of intensity, radiating perhaps to adjacent areas and prostrating the patient by its violence. If the upper cervical ganglia are chiefly affected, the first sensory symptom may be a sense of burning discomfort over the neck and occiput, which later develops into pain of the types noted above. Should the gasserian ganglion be attacked, the same sequence may be noted on the face, or less frequently, perhaps, the last two types may have their sensory onset with characteristic pain. The pain usually leaves after the appearance of the eruption, but may persist as a postherpetic pain for many months, and this may take the form of a violent otalgia or mastoidalgia. Especially in the aged, sensory symptoms of burning, discomfort, pain, or paresthesia may persist in the affected areas for many months or longer (in one of the author's cases they are still present after three and a half years). These sensory symptoms may be more annoying at night, causing loss of sleep with its attendant ills.

Hypesthesia, or obtunded sensation, has been noted in the concha and external auditory meatus in recent cases of herpes zoster oticus with facial paralysis.

At the onset of the disease, rarely has pain affected one side of the throat, giving rise to added discomfort and pain when swallowing, and radiating then to the ear or mastoid, or both. The reported cases developed herpetic eruptions over the intra-oral distribution of the glossopharyngeal, vagus, or facial nerves. Pain and soreness along the edge of the tongue have been noted rarely.

Kaufmann reported a case in which the diagnosis of acute mastoiditis was made and a mastoidectomy done, and Halphen described a case that seemed to be one of grave mastoid disease, for it appeared to present acute otitis media, acute mastoiditis, deafness, and possible thrombosis of the lateral sinus, all due to the great mastoid pain, inflamed drum, swelling of the neck, and facial palsy.

When confronted with cases presenting such serious symptoms and a clean-cut history of a regional herpes zoster cannot be obtained, the radiogram frequently will establish the condition of the mastoid and its cellular spaces. An examination of the spinal fluid may also be of value, first in determining an increased pressure, and second as to its cell content. The blood picture in certain cases may give some diagnostic points.

From a study of the literature and an analysis of reported cases, as well as those personally observed, the writer is led to believe that in many instances the tympanic membrane has been incised, and at other times mastoid surgery undertaken, in cases where this disease was not recognized; that mistakes in diagnosis may arise because many of these patients do not come under the observation of an otolaryngologist, or because the essential elements for correct diagnosis could not be or were not elicited in the history, and were not present for observation when the patient came under the care of an aural surgeon; that herpes zoster of the cephalic extremity is less rare than it seems, and that prompt investigation of all the symptoms associated with the relatively numerous facial palsies would place some of them, at least, as dependent upon affection of the geniculate ganglion by the specific virus of this disease.

Reflex Conditions Originating in the Ear. L. Ginsburg[4] reviews some of the literature and reports two additional cases. One was a case of persistent cough due to cerumen and the other was a case of vertigo from a similar cause.

The symptoms arising from ear conditions may be divided into two groups: (1) Direct or proximate, and (2) remote or reflex. Among the direct or proximate symptoms are fullness of the ear, diminished hearing or deafness, ear noises and pain. These are symptoms that are readily traced to the ear.

In the case of remote or reflex symptoms we have

(4) Ann. Otol. Rhin. & Laryng., December, 1928.

an entirely different state of affairs. When these reflex symptoms are associated with an active ear condition the relationship may be appreciated. However when there are no aural symptoms the relationship is often overlooked and the attention is focused entirely upon the distant organ apparently affected.

The outer and middle ear are supplied with a rich network of nerves. These nerves have numerous connections with other nerves, so that irritation or disease of the ear may provoke symptoms at a distance in the body ordinarily not looked for.

This paper shows that the ear may be a fertile source of reflex symptoms, which may manifest themselves in diverse ways. Such symptoms may present themselves in the respiratory, gastro-intestinal, cardiac, sympathetic and central nervous systems. There is here presented, therefore, a broad field for diagnosis.

In cases of persistent cough of obscure origin or in cases of other bizarre respiratory manifestations, the ears ought to be examined as a possible source of reflex irritation.

Cases of reflex gastro-intestinal disturbances are not frequent, but probably more so than is suspected. Any case of atypical gastric symptoms should have the ears examined.

All cases of nervous and mental disturbances should have a thorough otologic examination to eliminate foci of irritation which may be productive of reflex symptoms.

Trigeminal Disturbances of Otitic Origin. F. K. Hansel[5] states that the transmission of pain impulses from the sphenopalatine region to the ear has for many years engaged the attention of otolaryngologists. Great interest has likewise been shown in the study of reflex pains in the ear which originate not only in the sphenopalatine area and other parts of the trigeminal distribution, but those which originate in the domains of other

(5) Ann. Otol. Rhin. & Laryng., June, 1929.

cranial nerves which contribute to the nerve supply of the middle ear and mastoid, such as the facial, glossopharyngeal and vagus nerves.

The occurrence of reflex pain, transmitted in a reverse manner—that is from the middle ear and mastoid to the trigeminal, trigeminal-facial, glossopharyngeal and vagus endings, while not infrequently observed in acute otitis media and acute mastoiditis, is rarely observed in chronic otitis media and chronic mastoiditis.

In a recent report of twenty-five cases of glossopharyngeal neuralgia, collected by the author, attention was called to the fact that in several instances attacks of neuralgia could be excited, not only through a trigger area in the pharynx, but trigger areas were present on various parts of the auricle. Stimulations of these areas on the skin of the auricle excited paroxysms of the neuralgia, in spite of the fact that no areas of the region are apparently supplied by this nerve. It is safe to assume, therefore, that although the facial, trigeminal and vagus are considered the nerves supplying this region, certainly intimate anastomoses exist with the glossopharyngeal nerve.

In the final analysis of the nerve supply of the middle ear, mastoid and adjacent cutaneous area, it is apparent that there are intimate anastomoses between the various nerves involved to such an extent that they all form a nerve plexus. The facial is intimately associated with the trigeminal; also the vagus through the medium of the facial. The facial is connected with the trigeminal not only through the great superficial petrosal, but also through anastomoses with the auriculotemporal. The glossopharyngeal anastomoses with the vagus and the facial. The tympanic, or Jacobson's nerve, through the small deep petrosal nerve. Jacobson's nerve also anastomoses with the facial. The small superficial petrosal derived from Jacobson's nerve connects with the otic ganglion. These nerve connections suggest the possibility of pain transmission to the second

division of the trigeminal through the facial connections, and to the third division through the glossopharyngeal connections with the otic ganglion.

In conclusion, it may be said that several pathways exist for the transmission of pain impulses from the middle ear and mastoid to the trigeminal areas. It is highly probable that the facial plays the most important part, not only through its anastomoses with the glossopharyngeal and vagus, but through its own cutaneous branches. More direct connections between the glossopharyngeal and trigeminal through Jacobson's nerve and the small deep petrosal nerve by way of the great deep petrosal to the sphenopalatine and the small superficial petrosal with the otic ganglion are to be considered in the transmission of impulses to both the second and third divisions of the trigeminal. The part played by the auriculotemporal nerve probably plays a less important part in this consideration.

The Incidence of Nasal Sinusitis with Diseases of the Ear. E. P. Fowler[6] has devised a special chart for recording data on diseased ears and offers the following summary and conclusions regarding sinus disease associated with the ear disease:

1. Complete histories, tests and stereoroentgenograms of the skull give data, otherwise unobtainable, for the study and treatment of diseases of the ear.

2. The *x*-ray examination of the temporal bone, except for the pathologic changes in the mastoid, is not so important as stereoroentgenographic examination of the nasal sinuses.

3. Fifty-seven per cent (of 100 cases in children) showed moderate or severe involvement of the nasal sinus spaces.

4. Seventy-one per cent showed pathologic changes in the ethmoid septums.

5. Eighty-six per cent showed positive pathologic changes in the sinuses.

(6) Arch. Otolaryng., February, 1929.

6. The chronicity of the suppuration in the ear was directly proportional to the involvement of the sinus spaces, and indirectly proportional to the pathologic changes in the ethmoid septums.

7. Diseases of the nasal sinuses, and of the sinuses of the ear, are intimately associated, and prevention, alleviation and cure of one necessitates the prevention, alleviation and cure of the other. Recurrent inflammation in one is caused by inflammation in the other, just as sinusitis in one nasal sinus may occur or recur as a result of infection from one of the nasal sinuses.

8. There was no suspicion of a present or past suppuration in the ears, in only four cases (4 per cent). In no case were the nasal sinuses entirely normal. This means that in practically every one of these children there has been inflammation not only in the ears, but also in the nasal sinuses.

9. The coexistence of otitis and active or latent sinus infection is not coincidental.

Otologic Complications from Swimming in Summer Camps: An Attempt at Prevention. F. T. Hill[7] has investigated ear conditions in 14 Maine summer camps and concludes:

1. The incidence of otologic complications following swimming may be greatly reduced by proper routine precautions. These include careful regulation of the amount of swimming, avoidance of fatigue, chilling, etc., and especially proper swimming and breathing in the water. In Hill's experience the type of swimming or the bacterial content of the water do not seem to be important factors.

2. Elimination or restriction of cases which, due to existing pathologic conditions or respiratory infections, might be classed as hazardous, is of value in the prevention of complications. Careful medical supervision is essential.

(7) Ann. Otol. Rhin. & Laryng., June, 1929.

3. The acute head cold seems to be the greatest menace and presents the greatest problem.

Deafness in Syphilis: An Audiometric Study. According to D. W. Drury[8] use of the audiometer under proper conditions has been of great value in the study of these ear conditions. By means of its mechanism the measurements assume a certain degree of objectivity, as the threshold is approached from both directions and the devices controlled by the operator give real evidence of an inhibiting incooperation and an equally destructive over-willingness. Furthermore, the audiometer in its several forms plots what may be designated as the spectrum of hearing, an entity that may be regarded without too great a strain on the imagination as analogous to absorption spectrum in the field of light.

The measurements are all carried out either by the aurist himself or by a technician whom he has trained. Each point is repeated under sufficiently varying conditions so that inspection of the combined data leads to an authoritative value for the individual threshold of each intensity.

The measurements are made in a soundproof room, the construction of which has recently been described by the author. This is an extremely important provision for, as the writer has recently shown, slight noises tend to lower the acuity by a very definite amount.

It has generally been regarded as a fact that most cases of untreated syphilitic infection are likely to develop cranial nerve lesions, and that, of the nerves involved, the eighth has more, in fact, than any of the other cranial nerves, most constantly shown early changes. It has been stated further that under the present form of treatment a larger number of cranial nerve lesions have occurred during the early stages of syphilis than by earlier records would seem to have resulted from the older methods.

(8) J. Otol. Rhin. & Laryng., September, 1929.

While some patients do not complain of ear symptoms, the author thinks they have shown that the ear is involved very early by deafness even when tinnitus is not present. It has generally been assumed that tinnitus appeared first, but from the present study this would not seem to be the fact. At first, conversation is heard fairly well. This would apply, however, to early infected cases rather than to those presenting late third stage involvement. In a unilateral case of pure internal ear involvement of the milder type or where treatment is instituted early, a positive Rinne is possible, but, if the deafness increases, the character gradually changes until it becomes negative. The reason for the negative Rinne is that the bone conduction is transferred from the sound ear. Usually both ears are affected so that the positive character of the Rinne is accentuated. The fact is worthy of mention that in the nonluetic with normal hearing some reduction of bone conduction takes place, usually at about 50 years of age. On the other hand, in the hearing of the luetic with ear involvement, this shortening of the bone conduction takes place at an earlier age. Another patient is also worthy of mention. In unilateral affections the Webber test is localized to the well ear, while in bilateral cases the perception of the test is entirely lost. Inflations of the eustachian tube are without effect on an uncomplicated luetic.

While it has been generally held that deafness usually occurs late in syphilis, in Drury's observation this technically is not the case. Practically it is a very early manifestation, appearing as a gap of the dipper variety at 4096 dv. And when this situation involving both ears is found the case is greatly strengthened for a syphilitic infection. All will agree that syphilis at once becomes an active blood infection. Now the general trend of effort in the interpretation of audiogram curves has usually been an effort to correlate their shapes and levels empirically with some pathologic con-

dition. While certain results have been encouraging, the correlations suggest a trend rather than a defining condition.

The Nose and Throat

GEORGE E. SHAMBAUGH, M. D.

THE NOSE AND THROAT

General Considerations

Barbituric Hypnotics in the Prevention and Treatment of Rhinogenic Cocain Intoxication. M. R. Guttman[1] believes barbituric compounds of great value in the prevention of cocain poisoning. Barbital and phenobarbital are not soluble but their sodium salts are. As a prophylactic one may use 3 grains of phenobarbital or 10 grains of barbital 30 minutes before operation, to afford plenty of time for absorption. If one desires to use it hypodermically the same amount of the sodium salts may be injected, e. g. 3 grains of soluble phenobarbital (sodium phenobarbital) or 10 grains of soluble barbital (sodium barbital).

In mild intoxications the above dosages of the soluble salts are given hypodermically. In severe intoxications intravenous administration of the above dosages are repeated until the convulsions cease.

Postherpetic Trigeminal Neuralgia. M. M. Peet[2] states that postherpetic trigeminal neuralgia may persist for years, especially in the aged. It is usually characterized by two types of discomfort: a constant, dull, burning ache and recurring paroxysms of extremely severe, sharp, shooting, lancinating pains. The symptoms are often identical with those described in many cases of gasserian ganglion tumor.

Both irritative and destructive lesions have been found in the gasserian ganglion after trigeminal herpes zoster. However, no central lesions other than simple degeneration of the tracts have been observed, although the persistence of pain after section of the sensory root

(1) Illinois M. J., July, 1929
(2) J. A. M. A., May 4, 1929.

indicates some form of central pathologic condition. After cervical herpes perivascular infiltrations have been found to extend as high as the internal capsule.

Peripheral neurectomies and deep alcohol injections have not given permanent relief. This result should be expected, since definite pathologic changes are known to be present in the gasserian ganglion.

In the two cases of postherpetic trigeminal neuralgia, here reported, there was persistence of pain after section of the sensory root of the gasserian ganglion. One patient was considerably improved, the paroxysms of excruciating pain being abolished, but attacks of somewhat duller pain persisted till her death a year later. In the second patient, the frequency and intensity of the paroxysms were undiminished, although peripheral stimulation no longer induced an attack.

The complete permanent relief so certain for major trigeminal neuralgia cannot be assured the patient with postherpetic neuralgia. However, since the results Harris obtained in three cases by alcohol injection of the gasserian ganglion were so favorable, the author advises section of the sensory root in the belief that some patients will be benefited.

Ultraviolet Rays in the Treatment of Ear, Nose and Throat Conditions. According to C. R. Brooke[3] the chief use for ultraviolet radiation in the treatment of upper respiratory conditions is to combat infections, by sterilization of the parts affected. The therapeutic indications for ear conditions are eczema of the external canal, furunculosis, canal infection—as in the "bather's ear"—and chronic middle ear suppurations. Among nasal conditions ultraviolet rays are indicated in acute coryza, acute or chronic rhinitis—hypertrophic and atrophic types—hay fever (by no means a curative agent but does relieve the condition by destroying any accompanying infection), acute and subacute antrum disease, and ethmoiditis. Ultraviolet rays are indicated

(3) J. M. Soc. of New Jersey, November, 1928.

in throat and mouth conditions for relief of nasopharyngitis, Vincent's angina, acute tonsillitis, incipient peritonsillar abscesses, septic throat, ordinary sore throat, the red nodular throat after tonsillectomy and adenoidectomy, and, reports have been made that diphtheria carriers have been benefited (the writer has not had the opportunity to use ultraviolet rays in such cases), and, some cases of pyorrhea alveolaris have been benefited by intensive radiation to the affected gums. Ultraviolet radiation has been found particularly beneficial in the treatment of focal infections about the lymph nodes in the tonsillar pillars, the infratonsillar nodule, the lingual tonsil, and scattered areas of infection about the surfaces of the upper respiratory tract that carry or harbor infections.

In acute nasal infections, a nasal quartz applicator, attached to a water cooled lamp, is inserted gently as far back into the nasal cavity as possible, and is then withdrawn slowly to permit of fractional irradiation to to the entire mucosa; because all the effective rays are emitted at the tip of the quartz rod. The applicator should not be pressed heavily against the nasal membranes but allowed to lie gently upon the affected parts. This procedure will sometimes cause sneezing, when there is excessive irritation and congestion, but this can be obviated by swabbing the nasal cavities with a 2 per cent solution of novocain. Recently it has been the author's practice, in some cases, to swab the nasal cavities and throat with a 2 per cent solution of mercurochrome, because in addition to its antiseptic effect it increases the potency of the ultraviolet radiation. In complicating sinus disease, the applicator is inserted so that the tip approaches the affected sinus opening, a special curved applicator being advantageous for this purpose. It is unreasonable to assume that the ultraviolet rays applied intranasally will reach sinus disease; this can not occur unless the sinus mucosa is directly exposed or unless the applicator is inserted into the sinus cavity.

However, the auxiliary use of ultraviolet rays within the nasal cavities clears up localized infections resulting from the sinus, and, in primary nasal infections, prevents spread of infection to the sinus mucosa.

The duration of treatment at first should be 1 minute and this can be increased ½ to 1 minute, depending on reaction, at each subsequent treatment up to 8 or 10 minutes of exposure. Treatments should at first be repeated daily, then on alternate days, and later as symptoms require. The application should be accurately timed by interval time clocks to avoid blistering of the mucous membranes. In nasopharyngitis and pharyngitis, the posterior nares and nasopharynx are to be thoroughly rayed, using a curved quartz rod designed for this purpose, beginning at 2 minutes duration and increased ½ to 1 minute, depending on existing pathology, up to 5 minutes duration. The treatment should be repeated on alternate days until maximum improvement is obtained. This application may start coughing or gagging which can be obviated by applying topically a 2 per cent solution of novocain to the uvula and nasopharyngeal wall.

In acute tonsillitis and peritonsillar infections the Baldwin and Plank type quartz applicators on a water cooled lamp are directed for 2 or 3 minutes to each tonsil, and exposure increased 1 minute at each subsequent treatment until infection is aborted or symptoms are relieved. These radiations are supplemented by applications to each side of the throat, over the tonsillar glands below the angle of the jaw, with a flat lens quartz applicator under compression on a water cooled lamp for 2 or 3 minutes depending on the texture of the skin. Reaction should be at least a well defined second degree erythema; the counter irritant effect causes absorption, diminishes swelling and soreness, and relieves the pain. The same technic is successfully used in the treatment of tuberculous cervical adenitis and tuberculous lesions of the throat when accessible. In-

cipient peritonsillar abscesses can be aborted by 1 or 2 exposures if given before the actual formation of encapsulated pus.

In the treatment of hay fever, the ultraviolet rays have some therapeutic and prophylactic value when applied locally to the nose and throat and generally to the body; those that have a calcium deficiency usually respond promptly. The technic used in hay fever cases is as follows: intranasal ultraviolet with nasal quartz rod for 2 minutes duration; postnasal for 2 minutes with a special curvical quartz rod; 2 minutes to the throat with the pharyngeal quartz applicator, and a body radiation at 30 in. distances for 5 minutes. The local radiations are increased 1 minute at each subsequent treatment up to 7 minutes, and the general treatment 2 minutes up to 15 minutes, the lamp remaining constantly at 30 in. distance. Treatments during the actual attack of hay fever should be repeated on alternate days, whereas prior to an attack or the appearance of symptoms treatments should be given every third day beginning at least 3 weeks before expected onset of symptoms. Ultraviolet ray exposures will shorten, favorably modify, and often abort the distressing symptoms in some patients suffering from seasonal attacks of hay fever.

In the treatment of infections of the ears, the ultraviolet rays are given with a pencil-shaped quartz rod inserted well into the canal against the drum, or directly against the lesion in the canal, beginning with a 1 minute exposure and increasing one-half minute at each subsequent treatment until they are of 5 minutes duration. All cavities and lesions should be cleaned with a mild antiseptic, so as to be free of discharge and débris, before ultraviolet radiations are given. In chronic discharging ears, from middle ear infection, the ultraviolet radiation should be preceded by radiant light exposures.

In the treatment of Vincent's angina, the affected

areas of the mouth and throat are rayed with the different size quartz rods, depending on the extent and location of the lesion; commencing at 2 minutes and increasing 1 minute for each application until a definite reaction or fourth degree erythema is obtained and smears from the lesions are free of organisms. This treatment also requires time and patience with laboratory tests for check-up after every third treatment. The dosage to be effective must be continued to the point of actual destruction of tissue in order to sterilize this stubborn and more or less persistent type of infection.

In the treatment of tuberculous ulcerations of the tongue, mouth and throat, different sized flat surface quartz lenses are used, depending on the size of the lesion, attached to a water cooled lamp, beginning at 2 minutes exposure, increasing 1 minute up to 5 minute treatments, which are to be repeated on alternate days until the local lesion heals. This local radiation is successful only when given in conjunction with general body ultraviolet radiations, good food, rest and perfect hygienic conditions.

[That there may be some clinical value in the application of ultraviolet rays in the treatment of ear, nose and throat conditions seems probable. That it has a distinct therapeutic value in all of the numerous conditions cited by the author, seems rather doubtful. The clinical evaluation of the therapeutic measures of this sort for many of the conditions, especially the acute inflammatory processes which are self-limiting and vary more or less in different individuals, presents a more difficult problem and offers an unusual opportunity for optimism where one is hoping for results.—Ed.]

Actinomycosis. This report by N. Epstein and P. Schoenholz[4] is limited to actinomycosis of the jaw. The condition occurs most frequently between 20 to 30 years of age, males being affected more commonly than females, 80 per cent and 20 per cent, respectively.

(4) California & West. Med., June, 1929.

The classification of actinomycoses has been a complicated and a much disputed question. Some observers consider them bacteria, others place them among the hyphomycetes; while others place them between these two groups. On the one hand actinomyces resemble bacteria in size, thread formation, branching and arthrospore formation; on the other hand, hyphomycetes may be distinguished from the actinomyces by the size of the cells, their cell content and lack of radial striations. According to Lieske the actinomyces can be considered phylogenetically as higher bacteria, or reduced thread fungi, or a common antecedent of the bacteria and fungi. The following diagram will explain the relationship of the actinomyces to the fungi and bacteria.

Actinomyces { Oïdium, Hyphomycetes
Mycobacteria, Korynebacteria, Bacteria

Pathogenic as well as saprophytic strains of actinomyces are found widely distributed in nature. It is thought that the saprophitic strains are predominantly aerobic. The pathogenic strains isolated from infected tissue are anaerobic. All the intermediary forms from the long-threaded aerobic to the anaerobic bacillus-like type may be found. From a clinical standpoint it seems probable that the organisms exist as saprophytes in the mouth and gastro-intestinal tract and become pathogenic when the resistance of the tissues is lowered because of factors such as trauma and infection.

The usual form of actinomycosis or "lumpy jaw" begins somewhere about the oral cavity and extends into the subcutaneous tissues. A localized swelling develops which, in a few weeks, fluctuates and discharges a yellowish green pus. The abscess almost invariably points somewhere upon the skin.

In the pus which exudes yellowish particles can be seen which are known as the sulphur granules. These granules are characteristic of the disease. They vary considerably in consistency from stony hardness to that

of a semisolid fluid. Microscopically the sulphur granule is composed of a central portion made up of closely interwoven myceliae and a periphery of club-shaped forms. (Figs. 51, 52.) Club formation is probably a protective mechanism against the tissue juices. Occasionally particles simulating sulphur granules are seen in discharging sinuses, but they are usually clumps of bacteria.

Sooner or later a second abscess contiguous with the

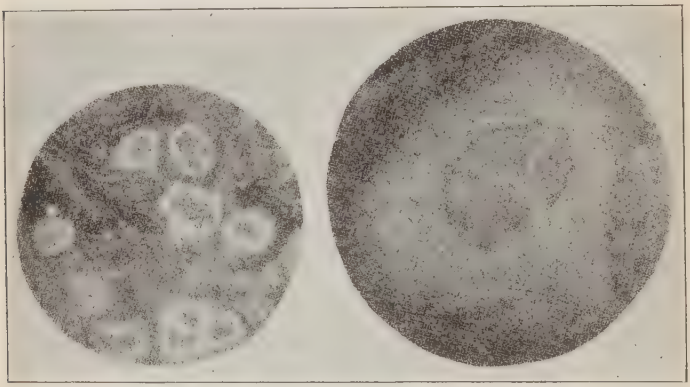


Fig. 51—Left: Sulphur granules in the pus. Low power.
Fig. 52—Right: Sulphur granule. High power.

original lesion forms, and during the course of a few months a row of abscesses are present which follow the general direction of the jaw. The lymph nodes are not affected except in the presence of secondary infection. The process rarely metastasizes by way of the lymphatics, but may enter the blood stream causing abscesses in distant parts of the body, such as in the liver or lungs.

The essential pathology consists in a central necrosis of the tissues, a surrounding zone of leukocytes and an outer area of connective tissue. This fibrous layer is ineffectual in preventing the spread of the disease.

The course of the disease is slow, lasting from one to

three years. Occasionally the infection may clear up very rapidly, that is, in a few weeks, or it may be extremely chronic, lasting as long as fifteen years.

Two classical examples of actinomycosis of the jaw are reported. From one case the *Actinomyces bovis* was cultivated and a specific vaccine was prepared. However, the patient was cured by foreign protein therapy, using a killed typhoid, paratyphoid A and B vaccine before the specific vaccine could be employed.

The iodids are helpful in treatment, but are not specific. When not tolerated well by mouth the drug may be given intravenously without disagreeable effects.

Inasmuch as the causative agent of actinomycosis is not found in nature, the theory that the disease is contracted by chewing straws, grasses, etc., is not well founded, and from a clinical standpoint this hypothesis in many cases does not fit the clinical history.

Four Interesting Jaw Tumors. The first case reported by P. Pickerill[6] was that of a woman, aged 30, with a tumor of the upper jaw. The patient was practically blind on that side, there was pronounced proptosis and the tumor could be definitely palpated above the zygoma. Biopsy revealed a small round-celled sarcoma. Following treatment with radium needles all signs of the tumor disappeared in less than two weeks. However, in five months the patient died of recurrence even though she had had two further treatments with radium.

The second case, that of a woman, aged 29, had a distended right antrum which had previously been diagnosed as a cyst and opened from the mouth. This opening had not closed, but was filled with what looked like bright red granulation tissue. Aspiration yielded no fluid and there was no typical thinning of the bone such as is associated with cysts; there was, moreover, some pain. The author removed some of the "pink" tissue for examination and inserted six needles of ra-

(6) M. J. Australia, Nov. 10, 1928.

dium (ten mg. each). The pathological report was granulation and inflammatory tissue only. The tumor rapidly disappeared and left the antrum empty. The patient was instructed to irrigate the antrum and return for closure of the aperture later. In six weeks she was back with the antrum full of growth; the same process was repeated with the same pathological report. Yet a third time the process was gone through, but each time it was noticeable that recurrence was quicker and the effect of radium less destructive. When the antrum filled for the fourth time and the eye began to proptose, the author determined, despite the pathological findings, on radical measures. He therefore removed the whole of the right maxilla, including the orbital plate, and eviscerated the orbit and again inserted radium. The laboratory report came back, "myxosarcoma." The result was as bad as could be. The growth returned with added vigor and malignancy; the orbit and the cavity filled rapidly and outshoots of tumor could be seen daily extending and affixing themselves to the normal tissues.

The third patient, a man aged 40, had during the war received a wound of the right lower jaw. He stated that when out rabbiting he got what he thought was toothache and the "jaw began to swell." As soon as possible he went into town where the swelling was opened. When he came under the author's care the incision was still open, discharging a little pus. The author made an exploratory opening, but found that the tumor consisted of densely packed new tissue in the circumference and a necrotic mass in the center. Massive doses of *x*-rays were applied, but in spite of this the tumor grew with extraordinary and alarming rapidity and in seven weeks the patient was dead. The pathological report was: "a very malignant osteogenic sarcoma—spindle-celled growth without new bone formation, arising from the periosteum."

The fourth patient, a woman aged 34, had had a swelling of the lower right jaw for 11 years. It had

attained an extraordinary size. *X*-rays showed it to be a "multilocular cystic tumor of the jaw" and therefore, according to Bland Sutton's classification an epithelial odontoma. The patient had been treated by numerous aspirations, curetting, and also by radium; all without much benefit. The question of excision of the right half of the mandible with subsequent bone grafting was discussed, but decided against, since there was practically nothing left of the upper part of the jaw, except the condyle, to which to graft. The author therefore adopted the plan of subperiosteal enucleation through a long incision along the lower border of the jaw. In order to prevent deformity a splint-obturator was inserted immediately after operation. An enormous number of cysts was removed; the cysts nearly filled a pint jar. The patient made a good recovery and now has a denture-obturator which keeps the cavity open. All large cysts of the jaw which cannot be with absolute certainty dissected out clearly, should be permanently open. It is the occluded epithelium which is likely to cause trouble, not the superficial. These tumors are to be regarded as locally malignant, with a possible tendency to become epitheliomatous.

Of interest in the three sarcomatous growths was the extreme rapidity of growth. In Case II and III the tumors almost could be seen to grow while watched and without any doubt there was definite increase noted at each daily visit. The author wonders what it is that is stimulating to these cells to proliferate at this enormous rate and yet not affect the adjoining cells. The tumor cells indeed seem to have some cytolytic action upon the surrounding tissues, paving the way for the extensions of pseudopodia-like processes of the new growth. "Might not the cytolytic property be more important than a possible local growth stimulant? All cell growth is held in check and differentiation appears to be largely due to growth association or the necessity of symbiosis with surrounding cells. If certain cells are removed from

this necessity as in tissue cultures *in vitro* or in the living tissues by the removal of this factor (? by an enzyme), then they will revert to indiscriminate proliferation. It may also be that radium has a selective and destructive effect upon such an enzyme and, if so, the method of using radium and its dosage should be materially altered."

The temporary effect of radium in the first case was most dramatic and almost equally pronounced in the second case. The author asks: "If temporary destruction can be brought about, why can it not by alteration in technic be made permanent?" The failure of radium to effect any satisfactory result in epithelial growths in the mouth or jaws seems to be generally recognized and this is illustrated in Case IV.

The obvious inference from all four cases is the enormous importance of early correct diagnosis and radical treatment if and when possible. Patients are more reluctant perhaps in the case of the jaws and face to submit to early operation, for fear of some deformity, but when they see that the growth itself is causing deformity they are willing to undergo any treatment advised, preferring often "to try radium first." If the latter fails many months of valuable time have been lost and all hope of surgical eradication is past.

Loose Cartilages in Temporomaxillary Articulation. H. B. Knapp[7] reports the case of a girl, aged 18, who, while yawning, apparently dislocated her jaw on the right side. The mouth was locked wide open, and there was excruciating pain in the right side of the face. While the usual procedure for reducing a dislocated jaw was being attempted, the joint unlocked with a snap and the patient was relieved. Following this, the temporomandibular joint was swollen and tender. The next day the jaw again became fixed with the mouth wide open, and from this time on it became a daily occurrence whenever the patient talked, laughed or yawned, or

(7) J. Michigan M. Soc., December, 1928.

while eating. The patient learned to unlock the jaw quite readily, but in two or three months it became a matter of reducing it as many as thirty or forty times a day. The painfulness of the condition varied inversely with the frequency. A relaxed capsular ligament seemed to be the most likely condition needing correction.

The capsule of the joint was exposed, but it could not be demonstrated to be relaxed, and any manipulation of the jaw did not reproduce the locking. An incision, however, through the joint capsule readily disclosed the cause of the trouble. Two small pieces of cartilage, attached by a thin fibrous pedicle, presented themselves in the joint. They were snipped off, and as no others could be found, the capsule was closed. No further trouble has been experienced.

Radium in the Treatment of Multilocular Lymph Cysts of the Neck in Children. F. A. Figi* says that of 13 cases of cystic hygroma in infants seen at the Mayo Clinic in the period from 1918 to 1927 inclusive, excision was considered advisable in only one. In the remaining 12 cases radium was used. Radium irradiation causes no pain and practically no mortality. It frequently causes complete disappearance of the tumor without scarring. Its principal disadvantage is that the treatment must be repeated at intervals of two or three months over a long period of time.

In the cases reviewed the dosage ranged from 3,000 to 7,000 mg.-hrs. per treatment with a screen of 2 mm. of lead and a distance of 2.5 cm. It was applied directly over the tumor. The total number of applications varied from one to nine, and the average number was four. Three of the patients are well, one has only a small nodule remaining, and two show marked improvement. Seven patients died from acute infection in the tumor. In some of the acute infections radium was employed without causing any apparent aggravation of the condi-

(*) Am. J. Roentgenol., XXI, 1929.

tion. Experience indicates that the use of radium has no bearing upon the likelihood of acute infections or the clinical course of an infection already present.

Treatment of Phlegmons of Dental Origin by Bacteriophage (d' Herelle). A. Raiga[8] reports two cases of grave phlegmon of the submaxillary region that occurred as complications of the difficult eruption of wisdom teeth in girls, aged 15 and 17, respectively, and one case of phlegmon, complicating a caries of one of the molars, in a boy, aged 19. The symptoms were so grave that the extraction of the corresponding teeth was considered contraindicated and was postponed until the amelioration of the condition. Polyvalent bacteriophage (d'Herelle) was injected locally into the infected tissues and subcutaneously, at some distance from the phlegmon (general bacteriophage treatment). The pain, dysphagia and trismus disappeared in a few hours, the general condition rapidly improved, so that the patients could resume their occupations, and the phlegmons were cured in eleven and nineteen days, respectively. The extraction of the teeth was done without any complications after the complete recovery of the patients.

Diseases of the Nose

Miscellaneous Nasal Conditions

Anatomic Studies of the Sphenopalatine Ganglion and the Posterior Palatine Canal, with Special Reference to the Use of the Latter as the Injection Route of Choice. In the hope of clearing up a number of uncertainties in respect to the injection of the sphenopalatine ganglion through the posterior palatine canal and in the hope of promoting greater accuracy of result, E. H. Campbell[1] made some dissections of the sphenopalatine ganglion and some craniometric measurements of fifty skulls.

(8) Bull. et mém. Soc. nat. de chir., May 4, 1929.
(1) Ann. Otol. Rhin. & Laryng., September, 1929.

A study of these measurements failed to show any regular and constant relationship between the width or depth of the palate and its length. A constant ratio between the depth of the palate and its length could also not be established. Therefore it was discovered that the exact location of the posterior palatine foramen could not be determined by a measurement of the width or depth of the palate.

The posterior palatine foramen was found opposite the third molar tooth in 72 per cent of the specimens, and in all instances close to the alveolar line.

After a study of measurements and variations in the anatomy of the hard palate a technic for locating the posterior palatine canal was decided upon as follows: "First palpate the hard palate in an attempt to find the depression corresponding to the location of the foramen. If this cannot be felt insert the needle first so that the shaft comes opposite the anterior edge of the first molar tooth close up to the alveolar edge, pressing the needle upward and slightly backward. If the needle does not fall into the canal, remove it and insert it again a millimeter or two directly posterior to the first insertion. When the molar teeth are absent the posterior edge of the hard palate, and especially the posterior end of the pterygoid process, should be palpated and the needle inserted first about two centimeters anterior to the edge of the pterygoid process.

The measurement of the distance from the posterior palatine foramen to the lower edge of the sphenopalatine foramen which corresponds to the lower edge of the ganglion showed an average of 2.85 cm. for the right side and 2.58 cm. for the left side in the adult skulls. It was found in the dissections of fifteen specimens of sections of the face that the average thickness of the soft tissue over the hard palate was .77 cm. Therefore by adding this to the average depth of the lower border of the ganglion from the posterior palatine foramen the average distance from the lower border of the gang-

lion to the mucous membrane surface of the hard palate was found to be 3.48 cm.

Variations in the posterior palatine canal were found that would influence considerably the course of the injecting needle. It was discovered that in order to have the needle pass directly to the ganglion it should be inserted and directed internally to slide up along the inner wall of the canal.

An average distance of 3.5 cm. from the posterior palatine foramen to the lower edge of the foramen rotundum was found. For the injecting fluid to have its fullest effect on the maxillary nerve the needle should therefore be inserted to a depth of 4.2 cm. from the mucous membrane surface of the palate.

The dissections consisted in the exposure of the ganglion, its roots and branches after an injection of 70 per cent alcohol stained with methylene blue had been made. It was found that the location of the needle point in the ganglion region varied somewhat according to the amount the needle deviated from its course up the canal. The relation of the ganglion to the posterior tip of the middle turbinate also varied considerably. It was decided that injections of fluid at the level of the Vidian nerve would probably give the most even distribution to the ganglion, its branches and roots. The needle point was found to be at the level of the Vidian nerve at an average depth from the palatal surface of 3.96 cm. In tracing the distribution of the injected staining fluid there was found to be some variation in its spread to the branches and roots, depending partly on the depth of injection and partly on whether or not the needle had deviated from its course up the canal.

Persistence of Nasal Lesions in Leprosy. J. G. Samson and C. B. Lara‡ state that recent observations made in the Culion Leper Colony indicate that the nasal mucosa is the seat of persisting lesions in some cases that

(‡) Philippine Islands M. A. J., June, 1929.

have been apparently cured under antileprosy treatment. As a basis for study, the authors surveyed the nasal lesions in 200 frankly positive cases of leprosy. The nasal septum was positive for *Myobacterium leprae* in 193 cases; the inferior turbinates, in 153 cases, and the nasal secretions, in 145 cases. Infiltrations and nodules, mostly at the junction of the bony and the cartilaginous portions of the septum and on the anterior portion of the inferior turbinates, were the most frequent lesions. Perforation of the septum, and ulcers, erosions or simple congestion of the septum or the turbinates alone were less frequent lesions. Only a few cases showed an apparently normal mucosa, but 50 per cent of these were also positive for *M. leprae*. Hypertrophy and atrophy of the inferior turbinates were also observed, but these conditions seldom gave positive bacteriologic results. All the other types mentioned were almost invariably found positive for *M. leprae*.

The records of all examinations on 685 negative patients and negative candidates made by the Negative Examining Committee during a period of nine months were studied for the total and relative incidence of the different types of persisting nasal lesions, in each of ten examinations. The average proportion of cases found positive in the nasal mucosa in the ten examinations was 20.6 per cent. The proportion of cases found positive in both nasal mucosa and skin steadily decreased from 4.9 per cent in the first examination to 0.9 per cent in the sixth; in those found positive in the nasal mucosa but negative in the skin it steadily increased from 12.5 per cent in the first to 28.7 per cent in the sixth examination; in the negative mucosa-positive skin and negative mucosa-negative skin groups it remained fairly constant in the first five examinations. The steady increase in the positive mucosa-negative skin group is considered definite evidence of the tendency of the nasal lesions to persist after the cutaneous lesions have disappeared. The proportion of positive cases increased in the seventh to

the tenth examination; this is attributed chiefly to the occurrence of relapses. The average proportion of cases showing a positive reaction only in the nose during the nine months' period was 17.4 per cent. Actually, of the 685 patients examined, 155 (22.6 per cent) gave positive reactions only in the nose at least once, and 126 (18.4 per cent) practically throughout the period. All the nasal lesions observed in frankly positive cases of leprosy were found to have their counterpart in the negative and near-negative cases. In these, the nodules constituted from 50 to 60 per cent of the nasal lesions, and the infiltrations, from 17 to 30 per cent. The rest presented varying degrees of congestion, erosion and ulceration of the nasal mucosa. Of the different types of positive nasal lesions, infiltrations, ulcers (and perforation) and nodules have been observed to persist for from a few weeks to six years after the cutaneous lesions had disappeared. In a small group of cases in which there was a relapse after a variable period of apparent inactivity, four times as many showed only nasal lesions as lesions that recurred only in the skin.

Headaches of Nasal Origin. It has long been the conviction of A. W. Proetz* that the proper study of headache, even of nasal headache, must be prefaced by a careful classification of symptomatology and nomenclature intelligible certainly to the physician, and as far as possible to the layman as well. The patient is unfamiliar with the internal arrangement of his nose and consequently lacks terms to designate even in a general way where his trouble lies.

Much nasal headache is therefore, strictly speaking, "nose ache" in that the pain is actually felt as being extracranial. The fifth nerve is the essential cranial sensation nerve and study of nasal headache resolves itself really into a study of nasal conditions in some way affecting the fifth nerve.

(*) J. Missouri M. A., November, 1928.

The author has found the following classification extremely useful:

1. Pain arising directly from mechanical aberrations of the nasal structures; the sinuses, the septum and the turbinated bones (in order of their importance).

2. Pain arising directly from inflammatory tissue reaction upon nerves or ganglia.

3. Pain arising directly through vasomotor disturbances, which produce tension or pressure upon the meninges or upon the end organs of sensation in the nose.

Mechanical aberrations include direct pressure of one structure against another; air pressure, occasioned in a closed sinus (this pressure may be positive or negative); contact of foreign bodies or new growths; irritation or drying of the mucosa occasioned by the uneven distribution of inspired air; and the last (but far from least) pressure from contracting postoperative scars.

Inflammatory changes include not merely those actively occuring within mucosa, periosteum and bone, but also the effects of the products of inflammation upon the surrounding nerve endings, as in the case of crusts, scars and adhesions.

The vasomotor disturbances are often part of the symptom-complexes of hay fever and asthma, or they may be the result of aberrations of the sympathetic tracts associated with the nasal ganglia.

The subject of sinusitis has seized the public imagination to the extent that patients with headache are constantly presenting themselves for treatment, with the home-made diagnosis of sinus disease or simply "sinus," as they call it, firmly established in their minds.

Such statements must be met with extreme skepticism. If one happens to be a rhinologist perhaps the best plan is to attempt to prove that the headache in question does not come from the nose, rather than that it does. This will at least call up for consideration the important, and sometimes obvious, extranasal causes of headaches.

No general rule holds for the differentiation of nasal headaches from others. They are apt to be localized affairs rather than generalized cranial pains. It does not follow that they are localized at the site of their inception. Sluder's "lower-half headache" is an example of this. Skillern observes that although pains referable to the frontal and anterior ethmoidals cells are usually confined to their respective locations, maxillary sinus pains may be supra-orbital; posterior ethmoidal and sphenoidal pains may be vertical or occipital.

It is characteristic of nasal headaches that they appear at stated times of the day, usually in the morning, and almost never at night. Exceptions to this rule are the acute empyemas with obstruction, and the pronounced septal impactions, which ache at any and all times.

To the nerve tracts already mentioned as avenues of pain, should be added the veins. These afford extensive and intimate communication between the nasal and the intracranial structures, and any interference with their normal circulation may be interpreted in terms of headache.

Little can be said here in regard to treatment, not because this is simple or of slight importance, but on the contrary because it taxes our judgment and skill to their limits, and because an incomplete discussion of it might be misleading.

Treatment will resolve itself in any case into the removal of one of the three causes enumerated above; mechanical pressures, inflammatory reactions, and vasomotor disturbances.

Determination of the Bleeding Point of Epistaxis. Old people bleed more often from the ethmoidal veins, young people from Kiesselbach or Mackenzie's area, one inch behind and above the nasal spine, in this, the ordinary site of epistaxis, one may see merely the venous oozing, but occasionally there is a spurter of some size which shoots out perpendicular to the septum. G. B.

McAuliffe** states that an endeavor should be made to clear out all blood clots and apply adrenalin first to the area. If the bleeding comes alone from this place the hemorrhage will slow up or stop temporarily long enough to apply nitric acid or chromic acid or other cauterant to the vessel which is still marked as a red dot on a blanched surface. In the meantime, if the patient is nervous and the bleeding has lasted for some time, a quarter grain of morphin will slow up the rapid pulse and help clotting. If the bleeding is not coming from Kiesselbach's area the turbinates should be inspected, using a medicine dropper or a suction tube to follow up the blood.

The bleeding spot may be near the attachment of the middle turbinate; a small pad placed there will control it if that is the site; this is a favorite spot in arteriosclerotic cases. Sometimes the bleeding comes from a bleeding polyp halfway back on the middle of the septum. After hemostasis is accomplished a circumferential resection of it will get rid of the enlarged vessels. Recurrent hemorrhages from the septum are often cured by a submucous operation which alters the circulation.

Another spot is far back on the convexity of the lower turbinate or near the floor. The suction apparatus is a great aid in locating the spots, because the nose fills up so quickly after swabbing and expelling the clots.

Conservative aids to localization besides suction are, raising the arms above the head, irrigation with water or saline solution at a temperature of 130 degrees or two or three injections of four ounces of ice water and pressure under upper lip by a pad to control the coronary artery.

Before resorting to tampons one should look for the customary points in their order of frequency. (1) Kiesselbach's area; (2) upper portion of the nose near the root of the middle turbinate; (3) on the middle of the septum where nevi may exist; (4) along the convexity

(**) M. J. & Record, Jan. 2, 1929.

of the inferior turbinate or the floor three quarters back; (5) for nevi scattered throughout the nose as reported by Brown Kelly.

Tampons are often the only means of stopping hemorrhages from an unknown site. Elderly people with high blood pressure will have compensatory bleeding from the ethmoidal veins or from the inferior turbinate deep in the nose. As in all surgical hemostasis, tampons are not *secundum artem*, yet the need of immediate results necessitates their use often.

The tamponade may be made by a soft balloon (shapes adapted to the nose are on the market) or by the ever handy gauze strips with a forceps or a gauze packer.

The Symes method of a posterior plug is satisfactory. In conclusion the author makes a plea, however, for searching for the bleeding points, and resorting to tamponage only when absolutely necessary.

Perforation of the Nasal Septum in Chromium Workers. The widespread use of chromium plating in industry has caused an increasingly large number of these workers to be deeply and irreparably branded. Chromium plating is accomplished by immersing the object to be plated in an electrolytic vat containing, among other elements, chromic acid. In this electrodeposition, oxygen is evolved on the insoluble anode and considerable hydrogen on the cathode. These gases, rising, tend to carry into the surrounding air a fine mist or spray of chromic acid. This spray, on being inhaled, deposits the chromic acid particles inside the nose on the mucous membrane. Chromic acid affects those persons exposed by causing (1) lesions of the skin and (2) irritations of the nose. It affects the abraded skin, causing deep ulceration. It affects the nose in causing an inflammation of the mucous membrane with ulceration of the nasal septum, which may later lead to perforation.

F. W. Dixon[2] reports 18 cases with perforation of the

(2) J. A. M. A., Sept. 14, 1929.

septum. The first symptoms experienced on entering the chrome room were sneezing, and a burning sensation in the nose. After a few days bleeding was encountered; later, blocking and crusting became the final factors of discomfort. Whistling during respiration when the perforation was small was noted in the majority of cases. The bleeding was not serious and never prolonged. In the cases in which perforation was encountered in those employed less than six weeks, all had been employed in similar work in other plants previously. Most of the perforations encountered were oval in outline.

As regards prophylaxis and treatment the author states that:

1. In the plating rooms where proper ventilation was employed this irritation was not encountered.
2. Employees must be warned not to pick at the nose.
3. The wearing of masks and gloves, while helpful, is difficult of enforcement.
4. In those already afflicted, the free use of white petrolatum to the septum caused all unpleasant symptoms to disappear. The use of mercurochrome and medicated petrolatum was not helpful.
5. Daily check up by the nurse when irritations are noted, coupled with regular inspection by the medical attendant, is advisable.

Tetany Following the Use of Cocain and Epinephrin in Intranasal Operations. S. E. Roberts[3] believes that tetany is a frequently overlooked symptom complex following the use of cocain and epinephrin in the nose. No direct references in the literature could be found. It is not a serious complication, but a very distressing one for the patient if untreated. It is not a drug intoxication and is not due to a condition or a single drug but to a combination of hypoparathyroidism, hyperventilation and epinephrin in nervous, emotional patients. It is satisfactorily and quickly relieved by sub-

(3) J. A. M. A., Sept. 21, 1929.

cutaneous administration of 5 c. c. (containing 100 units) of parathyroid extract-Collip. If untreated the tetanic spasms will normally subside in from two to four hours.

The author has seen 20 definite cases in his practice since 1921. All occurred in women of the so-called nervous type.

Vincent's Infection of the Nose: Case Report. H. I. Shulman[4] reports the case of an Italian boy, aged 3, with a sanguineous nasal discharge, cervical adenitis, fever, a greenish yellow membrane on the mucous surface of the upper lip and congested bleeding gums. Direct smears from the nose showed great numbers of fusiform bacilli and spirilla. Diphtheria cultures were negative.

Treatment consisted in swabbing the nose with half strength hydrogen peroxid, followed by the application of 5 per cent chromic acid twice a day. Later, nasal irrigations of sodium perborate were used, together with a mouth wash of potassium permanganate 1:5,000. Bromides were given for restlessness. The condition responded well to this treatment, the smears for Vincent's becoming negative on the fifth day. The nasal discharge stopped on the twelfth day.

The author points out that, while Vincent's infection of the oral membranes is well known, that of the nose is rare and may be overlooked owing to the frequency with which sanguineous nasal discharge is due to either diphtheria or foreign body. Vincent's infection may exist with diphtheria.

In any persistent, sanguineous discharge Vincent's infection should be considered and its presence or absence established by direct smears.

A Case of Acetanilid Addiction With Chronic Nasal Disease as the Cause: Case Report and Review of Literature. The patient reported by C. K. Rose, Jr., and A. H. Persky[5] suffered from paranasal sinus disease over

(4) Am. J. Dis. Child., August, 1928.
(5) Ann. Otol. Rhin. & Laryng., December, 1928.

a period of 40 to 50 years, with no serious ill effects except pain and physical conditions due to 20 years of acetanilid addiction. For 20 years he was a daily user of acetanilid (bromo-seltzer), a longer time than in any hitherto recorded instance. He was finally taking one ounce or 20 grains per day.

As is usually the case, symptoms disappeared when the drug was withdrawn. After relief of the nasal disease his drug taking was given up without any difficulty or struggle on his part.

Acetanilid addiction has a definite symptom complex, including cyanosis, heart enlargement, definite blood changes and characteristic urine findings. In the authors' case marked cyanosis of the nasal mucous membrane was present, a hitherto unnoted sign. The urine was deep amber and colored. A trace of albumen was found, also occasional red blood cells, a few hyaline casts, much mucus and many epithelial cells.

The authors conclude that in cases of acute cyanosis with collapse, poisoning by acetanalid or a similarly acting analgesic should always be suspected.

Stenosis of the Nasolacrimal Passageways. Any treatment for lacrimal stenosis, to be 100 per cent efficient, must relieve the patient's chief complaint, namely, overflow of tears and collection of pus in the eye. A certain number of patients complain of overflow of tears after removal of the lacrimal sac.

For this reason, D. M. Campbell and J. M. Carter[6] hesitate to advise a young patient to have the lacrimal sac removed; they advise, instead, one of the "short-circuit" operations to establish drainage into the middle fossa of the nose. They have been able to show, by roentgen examination, that the passageway made into the middle fossa has been open after four years.

Encephaloma or the So-Called Nasal Glioma. This case, reported by J. Browder[7], occurred in an infant, aged 11 months. The child had a scar in the midline

(6) Arch. Otolaryng., April, 1929.
(7) Ann. Otol. Rhin. & Laryng., June, 1929.

in the long axis of the nose which resulted from an attempted operation at two months of age, to remove a nodule over the base of the nose. The author's examination revealed a subcutaneous, rounded, firm nodule approximately 1.5 cm. in diameter. It could be lifted away from the nasal bones, but was attached to the underlying structures at its upper part. *X*-ray showed a small circular defect in the region of the glabella.

Under novocain, ½ per cent, the old operative scar was excised. By sharp dissection, the small mass was freed from below upward until a stalk was identified which led through the small circular bony opening described in the *x*-ray. The bony opening was enlarged in order to visualize the course of the stalk. The dura was incised at the upper aspect of the opening and the stalk, which appeared fibrous in character, was seen to divide into two parts, the larger part attached to the right frontal lobe, the lesser to the left. Both attachments were divided without any blood loss. There was no demonstrable communication with the ventricles.

The postoperative condition was favorable for several days but the child rapidly succumbed to what appeared to be pneumonia. Autopsy was not permitted.

This type of tumor is congenital, benign, and has never been described, except in the region of the nose, hence the term nasal glioma. That they are not a new growth but anomalously placed brain tissue is quite generally accepted; therefore, to apply the term glioma is misleading and should be abandoned.

As pointed out by Roche and Auglade, there are three types: Intranasal, extranasal and a combination of both. The intranasal as well as the combined intranasal and extranasal situation of such tumor may cause nasal obstruction, producing symptoms in no way different from those caused by any polypoid growth in the nasal air passage. For this reason, nasal obstruction in an infant should be carefully investigated before any operative interference is attempted.

The extranasally situated tumors are removed for cosmetic reasons only.

Histologically, the encephalomata are composed of embryonic type of nerve cells, neurofibrils and in some instances true nerve fibers. In this instance there was a large amount of collagen, which may be due to previous operative interference. The glial tissue was rather scanty and it probably was this histologic picture that led several writers to use the term fibroglioma. There were no cells that would cause one to believe that there had been any unusual cellular activity.

Reactions Resulting from Intranasal Surgery. In this article A. R. Hollender and M. H. Cottle[8] note that various types of reactions and complications frequently follow intranasal operations.

The factors which influence immediate postoperative reactions are: (a) physical status of the patient, (b) rhinologic status, (c) hospitalization, (d) asepsis, (e) nature of operation, (f) use of packs and splints, (g) postoperative treatment. A bacteriologic study of the surface and submucosa has failed to explain the occurrence of severe reactions incident to intranasal surgery. An indirect relationship wherein the bacteriologic state influences the resistance of the nasal membranous tissues seems likely. The nature of the operation with special reference to avoidable traumatic abuse of intranasal structures is an important consideration.

Late reactions or complications have at numerous times been reported in the literature. The unsolved problem of the use of packs and splints has again been approached with the conclusion that lubricated gauze strips serve quite satisfactorily if not packed too tightly and if not permitted to remain in the nasal chambers longer than 24 hours.

Answers to a questionnaire sent to leading rhinologists yielded little that could be summarized, as the replies were so at variance. There was general agreement on

(8) Illinois M. J., February, 1929.

the types of complications, while the majority also agreed that reactions of a mild or severe degree are of common occurrence. This in contradistinction to the contention of a minority that postoperative reactions are not experienced. Few offered any substantial suggestions for minimizing local or general reactions.

The authors are prompted to advise, in addition to the points already mentioned, the avoidance of local intranasal therapy during the first week after operation. The state of "postoperative depression" can be overcome by suitable general upbuilding measures, and with favorable systemic response, local reactions, if present, promptly subside. The application of convective heat to the face is probably one of the most valuable additions in therapy for the elimination of distressing local symptoms.

Production of Colds With Micrococcus Catarrhalis. The study of the prevention and treatment of colds is retarded at the present time through lack of agreement concerning their etiology. J. E. Walker[9] has previously reported two accidental upper respiratory infections which seemed to have a bearing on this question of etiology. One of the infections was apparently caused by B. influenzae and the other by B. bronchisepticus. The infections occurred under conditions which rendered it unnecessary to assume that a filtrable virus was in any way concerned in their causation. These two infections served as the basis for the following hypothesis: colds are not due to any one specific virus, but are reactions that can be brought about by many different bacteria. These bacteria are the organisms commonly cultivated from colds, and comprise staphylococci, streptococci, pneumococci, influenza bacilli, M. catarrhalis, Friedlander's bacilli, and possibly others. This hypothesis is definitely opposed to the idea that a specific filtrable virus is the primary cause of colds, and that ordinary bacteria are to be regarded merely as secondary invaders.

(9) J. Infect. Dis., March, 1929.

In order to test this hypothesis further, it seemed desirable to ascertain whether the symptoms of a cold could be produced by experimental inoculation of at least one other organism. Three experimental inoculations with M. catarrhalis were performed. The subject of the experiment was a volunteer, E., male, aged 35, the same person in whom the accidental infections due to B. influenzae and B. bronchisepticus occurred. The same strain of M. catarrhalis was used in the three experiments. The culture, which was sprayed in the nose, was originally isolated from a human throat, and had been on artificial medium for ten years. The first and third inoculations resulted in acute coryza. The second experiment produced no symptoms. Evidently a temporary immunity from the first attack nine days previous prevented symptoms from developing.

In conclusion the author states that the infections due to B. influenzae, B. bronchisepticus, and M. catarrhalis differed from acute upper respiratory infections occurring under natural conditions only in the history of the preceding accidental or experimental inoculation. It would, of course, be unwarranted to assume that a specific filtrable virus accompanied all three of these organisms. The observations are believed to place the hypothesis of the bacterial origin of colds on a fairly firm basis. Added weight is given to this view by the work of Robertson and Groves, who, in an extensive series of experiments, were unable to confirm the previously reported experiments of other authors relating to the rôle of a filtrable virus in colds.

Irradiation From Quartz Lamp in Control of Common Colds. C. H. Maughan and D. F. Smiley[1] found by observation of a group of persons susceptible to colds that a ten to sixteen minute exposure of the naked body (from five to eight minutes front, and from five to eight minutes back) during the dark months of the year to the rays of an ordinary mercury vapor lamp once a

(1) Am. J. Hygiene, March, 1929.

week at a lamp table distance of 30 inches will in most instances reduce by at least 40 per cent the incidence of colds in cold-susceptible persons. Since lack of ultraviolet irradiation is only one of several known factors involved in reducing bodily resistance to acute respiratory infection, the control of this factor alone must not be expected to be a complete panacea for the prevention of colds. The results reported by the authors would, however, appear to justify the use of short weekly irradiations with ultraviolet rays in certain cases of marked susceptibility to colds in which even a 40 per cent decrease in the frequency of colds would be appreciated.

Colds, and Asthma Associated with Colds. The results secured by I. C. Walker[2] when 97 patients who were subject to colds were treated with mixed streptococcus vaccine are discussed in detail. Previous to treatment 43 of the patients were subject to four or more colds a year, and 54 were subject to four or more attacks of asthma which were always associated with colds. The patients were treated periodically with a vaccine consisting of the most prevalent types of streptococci for each respective period. Thirty-nine patients were treated or were under observation for five or more years; 28 others, for four years, and 30 others, for three years.

Eighteen per cent of the patients were free from colds and asthma associated with colds; 12 per cent were practically free; 19 per cent had only one or two colds during the period of from three to five or more years that they were treated or under observation, and 10 per cent were free from colds for a year or more following each course of vaccine. Therefore, 59 per cent of the patients obtained either freedom or comparative freedom from colds and asthmatic colds for periods of a year or more following each course of vaccine.

Sixteen per cent of the patients required a course of

(2) Arch. Intern. Med., April, 1929.

vaccine oftener than once a year; their freedom from colds varied from six to eleven months after each course of treatment. In 20 per cent of the patients the results represented some combination of those already mentioned and were too complex to classify; for example, following the first course of vaccine the patient might be free from colds for months; following another, practically free for a year, and following a third, entirely free for a year or more. In 36 per cent of the patients, therefore, the results were satisfactory for periods of more or less than a year, and the frequency of colds was reduced by 50 or 75 per cent.

Five per cent of the cases in which the patients did not show any benefit following the course of vaccine are called failures.

Each year the vaccine consisted of those streptococci which represented between 85 and 90 per cent of the prevailing types. It is possible, then, that other varieties of streptococci, which were less prevalent and yet comprised from 10 to 15 per cent of those encountered, could cause colds in patients who were not entirely free from colds. A later paper will present evidence that this is the case; also that Staphylococcus pyogenes-aureus sometimes seems to be a cause of colds.

In addition to the 97 cases presented in the tables and discussed in detail, 89 other similar cases in which the patients were similarly treated, are mentioned in the discussion. Since it was not possible to follow up some of the patients for more than two or three years, and since the others were subject to colds at less frequent and more irregular intervals, it is difficult to determine the extent and duration of protection from colds. However, since as far as it was possible to follow these patients, the results, which were satisfactory and did not include any failures, substantiates those presented in detail.

Since the prevalence of the various types of streptococci varies from year to year, it is advisable con-

stantly to study the sputum and the nasal secretions of patients with colds. It is essential to do so each fall in order to know the prevailing varieties of streptococci for the ensuing cold period of the year; in other words, the same combination of varieties of streptococci does not suffice for more than one year.

Each fall, in the New England states, the administration of a vaccine consisting of the varieties of streptococci that are most prevalent at that time seems to reduce greatly the susceptibility to colds during the fall, winter and spring.

[Acute inflammation of the mucosa, of the respiratory tract—the condition known as acute colds—is not only one of the most annoying of experiences, but when one considers the sequelae, one of the most frequent causes for serious (even fatal) complications. One has but to think of pneumonias, otitis medias, acute nephritis—not to mention many other conditions directly caused by this malady which we call "head colds." The man who discovers a practical method for preventing or curing these acute infections of the respiratory tract will convey upon the human race a most important boon. Vaccine treatment would seem to be more logical than practical. This is due to the great variety of organisms that seem to be responsible for these infections. How one can expect immunity from vaccines made from one organism, or two or one-half dozen organisms, when there are many others prowling around to find a job, is not easy to figure out. To draw a conclusion because a patient has been subjected to vaccine therapy and has, for a period, been free from head colds, seems almost as logical as to account for the freedom from rheumatism by carrying around a rabbit's foot. How many of us have gone for years with no infection, and again through periods when one attack, for example, in the autumn, seems to make us susceptible to a series of attacks during the ensuing winter.—Ed.]

Secondary Factors in Uncomplicated Cases of Sea-

sonal Hay Fever. R. M. Balyeat[3] reports a study of 719 cases occurring during the past two years. During the first seven years of his study of allergic diseases uncomplicated cases of seasonal hay fever were tested only with pollen. During the latter part of this period, however, he became suspicious, on account of failures in obtaining good results in some cases, that some seasonal hay fever patients might be hypersensitive to other atopic substances than pollen, which would act as secondary factors. For this reason cases obtaining poor results were rechecked for the possibility of sensitivity to animal dander, other dusts, and foods. During the past two years all cases of seasonal hay fever who manifested no symptoms out of the pollen season were tested both by the scratch and intradermal methods, with pollen, animal epithelial, other common inhalants, and some of the important foods, just as one does routinely in cases of perennial hay fever.

Until the last two or three years it has generally been believed that asthmatic or seasonal hay fever cases, sensitive to foods but without evidence of urticaria or eczema, should be desensitized with, or should avoid, the inhalants to which they were sensitive, but removal of the foods to which they were sensitive was not considered important. The author has seen a number of cases, however, in both seasonal hay fever and asthma, who were desensitized to, or avoided the specific inhalants, with poor results, on whom he obtained excellent relief after eliminating from the diet the foods to which they were sensitive.

Although little has been written concerning the secondary factors in seasonal hay fever, Balyeat is sure that every allergist has been impressed with the importance of such factors in seasonal hay fever. The value placed upon the secondary factor, however, probably has been underestimated. It is his judgment that the part played by secondary factors is not an uncom-

(3) J. Lab. & Clin. Med., April, 1929.

mon cause of poor results in the treatment of seasonal hay fever.

From observation the author concludes that seasonal hay fever patients should be routinely tested with the common animal danders and other dusts, and the common foods, along with the pollens, and that if a marked skin reaction is found to the other inhalants or foods, they should at least be eliminated during the hay fever season.

Many seasonal hay fever patients require desensitization against one or more groups of pollen other than the one whose season of bloom corresponds to the period over which the patient suffers.

[The author emphasizes a very important consideration in the understanding and the treatment of hay fever. It is an extremely common experience that a person sensitized to a pollen gives the allergic reactions for many other things. The treatment of hay fever by desensitizing individuals becomes a problem complex enough to justify, in a larger sense at least, specialization, for the proper therapeutic handling of the situation.—Ed.]

Perennial Hay Fever: Diagnosis and Treatment, Based on the Study of Four Hundred and Forty-one Cases. From his experience R. M. Balyeat[4] arrives at the following conclusions:

1. Symptoms of perennial hay fever are frequently not prominent, compared with those of the seasonal type.

2. Itching of the mucous membranes of either the eye, nose, roof of the mouth, posterior pharynx or eustachian tubes is a sign that is probably never absent in perennial hay fever, and therefore might be considered a pathognomonic symptom, not only of perennial hay fever, but of any form of allergy.

3. An etiologic factor in perennial hay fever may be a sensitivity to any inhalant protein. A sensitivity to any food (wheat being most common) and some drugs

(4) Southern M. J., May, 1929.

may be a primary cause, and is a frequent secondary factor, in perennial hay fever.

4. Multiple sensitivity is the rule.

5. Paranasal infections are usually only coincident with the hypersensitive state, and are probably never a primary factor.

6. Heredity is the chief factor in determining whether a patient will ever develop symptoms of perennial hay fever.

7. Additional evidence that perennial hay fever is based on a hypersensitiveness to some atopen is the fact that perennial hay fever, seasonal hay fever, asthma, eczema, and migraine, are all interchangeable in the linkage.

8. General health of perennial hay fever patients is far above the average.

9. Complications are common in perennial hay fever, asthma being the most frequent one.

10. Nasal surgery in perennial hay fever is often needlessly done.

11. Mental activity of perennial hay fever patients is above normal.

12. Dermal tests in perennial hay fever, on the whole, are unsatisfactory.

13. Treatment consists of three measures, namely, elimination, education and desensitization.

[An instructive communication! It does well to emphasize the hereditary factor in hay fever. This is true, not only for the perennial, but also for the seasonal type. It is of interest to note his conclusions regarding the futility of intranasal operation, and the secondary rôle played by infection of the sinuses. These conclusions are in keeping with our own observations. The day should be over for indiscriminate intranasal surgery, correcting such anatomical irregularities as deflections and spurs of the septum, in the hope of curing hay fever and, we might add, for the prevalence in some quarters of operations upon the ethmoid or the other accessory

sinuses, without sufficient evidence that these regions are the seat of any alterations, the correction of which could possibly be expected to influence the hay fever or asthma. Cases of ethmoiditis requiring surgical interference present no difficulty in diagnosis. They are for the most part the hyperplastic type in which polyps spring. The assumption that susceptibility to head colds, systemic infection, etc., may be due to some intangible undiagnosable ethmoiditis and that an operation on the ethmoid is likely to be of benefit, is one of the fads of rhinology.—Ed.]

Nasal Polyps: Their Origin and Solution. In this detailed article O. Hirsch[5] reviews the past and present knowledge of this subject. He states that he believes all recurring polyps must lie in the vicinity of the accessory sinus openings. This location probably holds in the great majority of all polyps, but not for all. A small number of polyps have another location, e. g., on the anterior end of the middle turbinate and in accessory furrows of the middle turbinate. These are the polyps which arise from a primary catarrhal rhinitis, as authors certainly have assumed for all polyps. The writer calls them therefore primary polyps. These show little or no tendency to recur, while polyps which arise from the sinuses—and they are the majority—regularly recur; so he calls the latter secondary or recurring polyps. These latter polyps are partly prolapses of the catarrhal mucous membrane of the sinuses, and arise by incarceration of peaks of mucous membrane or by a continuation of the catarrhal inflammation of the sinus by way of the ostium of the sinus. According to the frequency ratio the polyps arise mainly from the antrum, then in the sphenoidal, ethmoidal and frontal sinuses.

From the presence of polyps, especially such as show inclination to recurrence, and from the site of the polyps, a catarrhal inflammation of the affected cavity

(5) Bull. Battle Creek Sanitar. & Hosp. Clin., March, 1929.

can be diagnosed, just as a purulent inflammation of the affected sinus from the finding and localization of the pus streak.

[We are not able to follow the author entirely in his conclusions. That nasal polyps appearing in the nasal cavities occasionally develop as an extension from the mucosa of the sinus, has been amply demonstrated. That this explains most of all the cases of recurring nasal polyps is hardly a justifiable conclusion. Nasal polyps spring from the lining of any ethmoid cells. It is the ultimate expression of the hyperplastic ethmoiditis; and the common source for the development of recurring nasal polyps is from the ethmoid cells and not from one of the other sinuses.—Ed.]

Zinc Ionization as a Treatment for Intermittent Nasal Obstruction. The symptom of intermittent nasal obstruction is particularly annoying at night and is usually associated with a slight nasal discharge and occasional attacks of sneezing. These patients are sensitive to the slightest atmospheric changes and at times are quite free from symptoms. The intranasal examination reveals turgescence of the nasal mucosa, especially over the inferior turbinals, and there is also thickening of the mucous membrane over the septum. The membranes shrink readily under the administration of epinephrin, and there are no actual hypertrophies. Subacute sinusitis is responsible for some of these conditions, and this is benefited by measures leading to improvement in aeration. However, poor hygienic conditions are almost always a factor and probably the most important cause of this obstruction.

The situation is a difficult one to handle and calls for general treatment as much as local therapy. Hygienic surroundings must be improved; the patients must have fresh air, sunshine and sufficient exercise. A change of climate is always beneficial. Various methods of operating on the nose have been employed but usually with results which in the end are unsatisfactory.

M. L. Harris[6] believes that zinc ionization of the mucous membrane of the nose is a method of treatment which recommends itself for selected cases. Feldman used the copper electrode in the nose, claiming improvement in 80 per cent of his patients. Friel and others have used zinc ionization in chronic suppuration of the middle ear, with satisfactory results. St. Clair Thomson quoted Creswell Baber as successfully using a positive galvanic current in vasomotor rhinitis. The method of application is as follows: Treatment is applied to one side at a time. The positive pole of the galvanic machine is connected with a zinc wire. The latter is wrapped in cotton soaked in 2 per cent zinc sulphate solution made broad enough to cover the inferior turbinates. Additional packing is placed above this, and dry cotton is packed around the applicator or in the nares to prevent circuiting of the current. The negative applicator, consisting of the ordinary flat cotton disk, is soaked in salt solution and held tightly in the hand. The current is then gradually turned on and allowed to flow for fifteen minutes. There is at first considerable sneezing, which subsides in a few minutes. The strength of the current is about 4ma. On removal of the packing the mucous membrane appears shrunken and gray. This treatment must be repeated from three to ten times at intervals of several days until the desired room is obtained. This method is equally useful in cases of ethmoiditis, which causes secondary turgescence of the inferior turbinates.

Chronic Rhinitis. One of the frequently observed conditions is that of simple chronic rhinitis. The most prominent symptoms are obstruction and so-called "catarrh." Vague as this term is, it implies a state of inflammatory change with secretion and difficulty in breathing. Certain factors such as the weather, food, temperament, and physical status of the individual play

(6) Arch. Otolaryng., July, 1929.

a part, but even if these are corrected local treatment cannot be avoided.

According to A. R. Hollender[7] it is well to summarize the numerous measures which have from time to time been suggested. Relief is afforded the patient by means of astringents. These have a shrinking action on the membranes, and, temporarily, at least, the patient is improved. Some of these solutions such as epinephrin and cocain, or combinations of them are commonly employed in the course of routine office treatment. Occasionally, too, their use is advised for home care. Their secondary effects are, in most instances, so distressing as to warrant interdiction of their use for relief purposes. Nasal washes, antiseptic drops, such as some of the more recently advanced silver and mercurial derivatives, offer little in the way of favorable action. For the intumescence of the inferior turbinates, either the chemical or actual cautery has been advised, but only in a small percentage of patients, have the results been successful and of long duration.

As a result of this dissatisfaction, surgery has been frequently resorted to, but probably more so than indications warranted. Even after surgical intervention, the nasal membranes do not always change their characteristics. The thickening persists and hypertrophy ensues. The symptoms become aggravated and if the pathological process continues, polypoid changes in the tissues occur. This state calls for surgery as nothing short of this will produce a good result and restore normal function.

In simple chronic rhinitis and in less advanced cases of hypertrophic rhinitis, zinc ionization has been found to be an effective remedial measure.

It is highly probable that some of the usual methods of treatment, carefully and rigidly carried out, would improve this nasal condition. From his experience with a large number of these cases, Hollender recommends

(7) Arch. Physical Therapy, January, 1929.

zinc ionization. The nasal chamber is packed with long narrow strips of gauze, made wet in a weak solution of zinc sulphate (½ to 1 per cent). A fine flexible copper wire is used and one end fixed into this wet packing. The other end of the wire is connected to the positive pole of the galvanic apparatus. The negative electrode, a wet pad about four by five, is now fixed on the patient's forearm and a wire from it connected to the negative pole of the apparatus. Some dry cotton is placed against the wet packing in the nostril in order to prevent dripping and unnecessary conveyance of the current along the stream of the excess solution. The current is turned on gradually, increasing it to 8 or 10 ma. The current having been on for ten minutes, it is slowly discontinued and the switch cut off. The wire which was inserted into the wet packing is extracted and the cotton around it is examined. The bluish stain of zinc indicates that a true chemical change has taken place. The remainder of the wet pack is now removed and the nasal space inspected. The membrane is grayish in appearance. The turbinates have been depressed temporarily by the packing and do not return to their former position.

The method is ideal for children. It can be carried out with little difficulty in patients who have definite indications for operation, but in whom substantial treatment for temporizing purposes is necessary.

The results in several hundred cases during the past four years have been uniformly good. It must be remembered that proper selection of cases is important as is due attention to general measures which very often aid in the correction of chronic rhinitis. As a local remedy for this affection and the less advanced cases of hypertrophic rhinitis it has given every indication of possessing greater merit than any other non-surgical therapy known at the present time.

[The rhinologist welcomes any practical suggestions for the relief of the very annoying symptoms resulting

from chronic rhinitis, and where surgical interference so frequently is of no value.—Ed.]

Ozena. In reporting five cases J. I. Kemler[8] concludes that while the treatment for this mysterious disease varies widely, as evidenced by reports from many authors during a period of about thirty years, the principle of narrowing the nasal chambers has remained outstanding.

The implantation of ivory is the simplest and the mildest operation and calls for practically no after-treatment. The ivory has remained in situ in the floor of the nose, in some cases for more than three years, with the same beneficial results as when the operation was first performed. This, in Kemler's experience, proves that implantation of ivory into the floor of the nose is a most satisfactory treatment for ozena.

Radium Therapy in Atrophic Rhinitis with Offensive Odor (Ozena). L. Hubert and O. O. Meyer[9] have used radium treatment in five cases of ozena, and the results have been satisfactory. They do not claim to have cured the patients, but believe that this treatment, used by one who knows its dangers and limitations, is a valuable aid in attacking the most obnoxious feature of the disease, namely, the foul odor. In four cases the foul odor disappeared, and in one case it was much diminished.

In all the cases, the crusts became much less in quantity and softer, so that they could be removed with greater facility. The authors believe that, if the cases are carefully studied, and syphilis and suppurating sinusitis excluded, radium has a new field of usefulness in a disease that up to the present time has completely baffled otolaryngologists.

Congenital Defects of the Vomer and the Development of Deformities of the Septum. According to Gruenwald, a hypoplasia of the sphenoidal part of the

(8) Arch. Otolaryng., August, 1929.
(9) Ibid., August, 1929.

septum accompanies a defect of the palate, but it can also occur by itself. Congenital defects of the vomer are reported in the literature. In addition, the defects of the quadrangular cartilage are constituted so that the cartilage, as well as the mucous membrane, is missing, and holes of various sizes can be seen. The opening sometimes is permeable only for a fine probe, but the whole cartilage may be missing. K. M. Menzel[1] describes a case in point in which only the osseous vomer was completely absent, whereas the whole mucous membrane was intact. Gruenwald states that arrested development occurs: (1) by virtue of faulty involution of temporary forms; (2) through lack of normal occlusion; (3) through persistence of early steps of development, and (4) through lack of formative material.

The author summarizes that in his case a complete congenital aplasia of the osseous vomer existed and a pronounced vertical deviation of the lamina perpendicularis and of the lamina quadrangularis toward the left side. Furthermore, a completely developed crista lateralis presented itself along a line which otherwise corresponds with the connection between the crista palatina, the lamina quadrangularis and the lamina perpendicularis with the vomer. As the lamina perpendicularis could develop freely downward, it must be assumed that in this instance, the deviation, and especially the crista lateralis, were not caused by external factors influencing their growth but by the embryonic lay which brought about the deviation of the septum and the overgrowth of the lower border of the lamina perpendicularis in the form of a crista lateralis. The case reported permits the conclusion that a number of septums are arranged in the embryonic lay not in the vertical plane. The deviated septum, with its sharp elevations, is surely of embryonic origin in a number of instances.

Replacement of the Lower End of the Dislocated

(1) Ztschr. f. Hals-, Nasen-u. Ohrenh., Sept. 5, 1928.

Septal Cartilage Versus Submucous Resection of the Dislocated End of the Septal Cartilage. According to M. Metzenbaum[2] the principles involved in a case of a fractured dislocated lower end of the septal cartilage are:

1. The cartilage is dislocated laterally from the

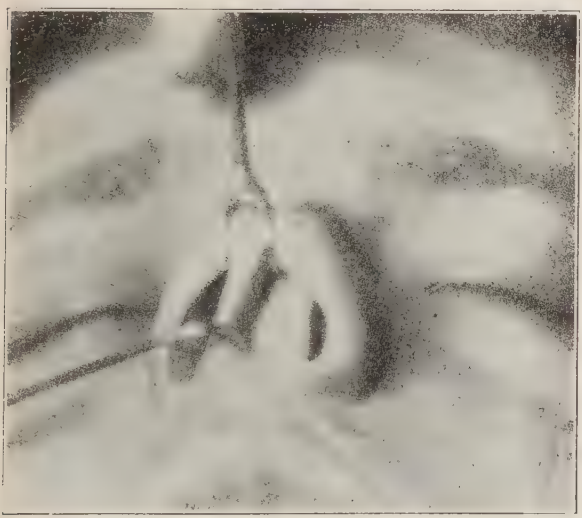


Fig. 53—Fracture dislocation of lower end of septal cartilage, which appears like a partially open door, still supporting the soft tissues of the nose laterally. If the major portion (or all) of this deflected cartilage is removed by a submucous resection, the lateral support to the soft tissues of the nose is partially or totally removed, and the tip of the nose will droop. If this deflected cartilage is reset into a straight plane, the soft tissues of tip of nose are again supported and the patency of the nares is again reestablished.

groove in the vomer.

2. The cartilage is removed from the supporting position in the columella.

3. The cartilage is removed from the supporting position underneath the soft tissues of the nasal tip.

4. These changes at the end of the septal cartilage result in a drooping of the nasal tip so as to form a slight

(2) Arch. Otolaryng., March, 1929.

beak and render the columella slightly concave from below upward.

5. On the side of the lateral deflection of the cartilage, the ala and the nostrils are slightly widened.

6. The opposite ala is slightly flattened on top and the nostril somewhat narrowed.

7. The deflected cartilage causes a partial or nearly

Fig. 54—Incision along free edge of dislocated septal cartilage and separation of mucous membrane on lower or anterior surface of dislocated cartilage; which is really the mucous membrane from the opposite nostril separated from cartilage up to angle of deflection. The mucous membrane on upper or posterior border of dislocated cartilage, or the mucous membrane that lines the dislocated cartilage in the nares in which the operation is being performed, is not separated from the cartilage.

total obstruction to this one nostril.

8. In the other nostril, there is a rather sharp angle of deflection of the cartilage resulting in a partial or nearly total obstruction of this nostril.

If, by a submucous resection, the major portion (or all) of the deflected lower part of the septal cartilage is removed, then part or all of the lateral support given by the deflected cartilage is removed (Figs. 53, 54, and 55), with the following results:

1. A sharp angle is formed by the drooping of the

soft tissues at the lower end of the remaining septal cartilage.

2. The nasal tip comes closer toward the upper lip.

3. The nasal tip becomes more beaklike.

4. The columella is rendered more concave from below upward.

5. The contraction of the scar tissue from before backward pulls the nasal tip downward in an irregular manner from 3 to 5 mm. within a few months.

6. The median wall is made smooth, but the nares

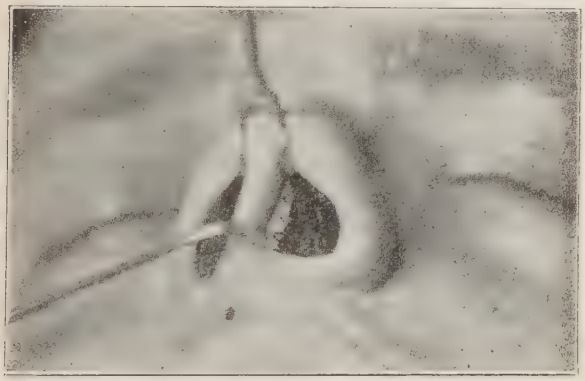


Fig. 55.—The dislocated septal cartilage reset. Sutures to close the mucous membrane incision.

are not rendered patent, because the change in the position of the drooping nasal tip interferes mechanically with the intake of the air and renders nasal breathing more difficult; hence, the patient frequently resorts to raising of the tip so he can breathe better.

If, instead of removing the dislocated lower end of the septal cartilage by a submucous resection, the cartilage is reset in the groove in the vomer, restored to its former supporting position in the columella and replaced underneath the soft tissues of the nasal tip:

1. The lower end of the dislocated septum will be brought into a straight plane.

2. The columella will be stiffened.

3. The soft tissues of the nasal tip will be supported.
4. The depressed nasal tip will be raised.
5. Both nares will be rendered patent.
6. The nasal breathing will be reestablished.
7. The tip of the nose will assume a dignified appearance.
8. In children, the lower end of the septum and the nasal tip will develop normally.

The Prevention of Nasal Deformities Following Submucous Resection of the Nasal Septum. From his experience W. W. Carter[3] concludes:

1. All injuries to the nose should receive prompt attention and the fractured and dislocated parts should be placed in alignment by means of the *bridge-splint*.
2. The submucous operation, save as an emergency measure, should not be performed before the eighteenth year.
3. When the submucous operation *is* performed, whether the patient be a child or adult, conservation of tissue should be the keynote.
4. The septum should be removed by means of punch-forceps and great care should be taken not to dislodge the upper edge of the cartilaginous septum.
5. Correction of deformities resulting from the submucous operation can be corrected only by the autoplastic transplantation of bone, cartilage or conjoined bone and cartilage.

Many of the cases of nasal deformity following the submucous operation that have come under the author's observation bore unmistakable evidence of unskillful work on the part of the operator, and the surgeon who would master the submucous operation must develop a perfect technic and must have manual dexterity.

[A communication from Carter on this subject is of unusual value for he has had a very wide experience. We are glad to see him emphasize the postponing of corrections in adolescence. Every generation of rhinolo-

(3) Laryngoscope, January, 1929.

gists must learn for themselves the dangers of careless surgery. The risk of producing disfiguring deformities of the nose through too enthusiastic removal of a large part of the septum is indeed very great. So often we get the impression that the operator prides himself on the extent of the septum which he is able to remove. We commend Dr. Carter's advocating conservative removal of the deformed septum. What one should look for is not an ideally straight septum. Few normal noses

Fig. 56—Forceps devised by Ruskin.

have an ideally straight septum. Septum irregularities more or less conspicuous, are the rule, rather than the exception; and it is the exception that these irregularities of the septum produce any symptoms whatever. The idea that an irregular septum produces postnasal catarrh, or is a factor in causation of tubo-tympanic processes, has been responsible for a flood of indiscriminate operations on these harmless conditions.—Ed.]

Technical Advances in Otolaryngology. S. L. Ruskin[4] states that in performing the submucous operation for the correction of septal deflections, the anterior por-

(4) Arch. Otolaryngol., May, 1929.

tion of the perpendicular plate frequently offers considerable resistance to the ordinary bone-cutting forceps. Breaking the bone in this area is both dangerous and uncomfortable to the patient. The author therefore devised a forceps with a mechanical advantage of about four, so that the same force used in the hand gives four times the cutting power at the biting edge. It is surprising how easy the hardest septal bone is cut with this added mechanical advantage. The female portion of the forceps is slightly beveled, so that the cut piece is held gently in the instrument and is easily shaken out. This

Fig. 57—Instrument for the reduction of nasal fractures.

saves the time necessary for removing the cut particles. The easier cutting allows quicker and more accurate work. (Fig. 56).

A New Instrument for the Reduction of Nasal Fractures. One of the difficulties encountered in the reduction of nasal fractures is the liberation of overriding or depressed fragments. An attempt to replace lateral overriding by force frequently results in breaking of

the thin edges of the fragments with consequent loss of bony substance. In this type, as well as in the depressed fracture, it is necessary to raise the bony nasal bridge from within so as to free the bones from their unnatural position and permit replacement in the midline. To accomplish this frequently requires considerable force, as impaction is a common observation.

The instrument devised by S. Salinger[5] enables one to accomplish this purpose with ease. The thin intranasal portion is slipped into the nose and carried well under the bridge. The handle, which is set at an angle of approximately 60 degrees, fits the grip nicely and permits the operator to exert traction upward and forward in the direction away from the plane of the face. In this manner, it is easy to lift the bridge clear of its impingements so that it can be swung back to its natural position. If the fracture involves just one side, it will be necessary only to apply pressure with the flat blade from within against the depressed fragment to accomplish its replacement. (Fig. 57).

Nasal Accessory Sinuses

The Relative Efficiency of the Clinical and the Roentgenologic Methods for Sinus Disease. R. A. Kern and H. P. Schenck[6] first observed 200 asthmatics. The patients were independently examined by competent rhinologists and roentgenologists. Following this the data of each was compared. It was desired to check all pathologic sinuses by operation, but for obvious reasons only 86 patients were operated on. However this number gave a basis for checking both clinical and *x*-ray examinations. As a final check 50 so-called normal patients were put through the same examination. Naturally no operations were performed on this group. While a

(5) Arch. Otolaryngol., June, 1929.
(6) Am. J. M. Sc., August, 1929.

high incidence of sinus disease was found both by roentgen ray (80.5 per cent) and clinically (67 per cent), there was extensive disagreement between the findings of the two examinations in individual sinuses: 33.2 per cent in the ethmoidal, 29.5 per cent in the frontal, 27 per cent in the maxillary and 17.2 per cent in the sphenoidal sinuses. In order to explain these discrepancies, operative check was carried out whenever possible. Unfortunately, no frontal sinuses came to operation. In the ethmoidal sinuses a roentgen ray error of 14.3 per cent was due chiefly to the failure to find relatively acute involvements and polypoid disease, or to confusion of overlapping sinus areas. A clinical error of 24.3 per cent was due to failure to recognize chronic disease. In the sphenoidal sinuses a roentgen ray error of 10 per cent and a clinical error of 30 per cent were due to practically the same causes as in the ethmoidal group. In the maxillary sinuses, figures of alleged error for the roentgen ray of 48.2 per cent and for the clinical examination of 43.2 per cent (errors largely attributed to calling a normal sinus diseased) are greatly vitiated by inaccurate and inadequate operative check, especially the determination of the state of an antrum merely by irrigation. In a sufficient number of adequate studies, however, both methods of examination were shown to be in error, chiefly in the finding by both methods of evidences of disease past, not present, also in the failure of roentgen ray to find acute recent infection, and in the clinical failure to find chronic disease because of the fallacies of transillumination.

Clinical and roentgen ray examinations of a control group without a history of recent respiratory infections or history of sinus disease showed a roentgen ray incidence of sinus involvement of 72 per cent and a clinical incidence of 26 per cent, the number of sinuses per person on roentgen ray examination being practically the same in asthmatics and controls. These findings are considered further evidence that sinus disease tends to pro-

duce permanent structural change which will often be found by roentgen ray and at times on clinical examination, long after the disease itself is over. The age of the patient did not seem to have any material influence upon the incidence of positive clinical or roentgen ray findings in asthmatics or controls. The authors' conclusions are:

1. Neither the roentgen ray nor the clinical examination of the paranasal sinuses is 100 per cent accurate, or comes anywhere near it.

2. Of the two, the roentgen ray is the more sensitive, especially in the study of the ethmoidal and the sphenoidal sinuses.

3. The roentgen ray examination will pick up the evidences of sinus disease past as well as present: a positive roentgen ray finding therefore, does not imply clinically active disease.

4. The attempt to interpret roentgen ray findings in terms of pathologic change (thickened mucous membrane, polyps) may be misleading, since the alleged diagnosis is not infrequently erroneous.

5. The roentgen ray examination will often overlook acute recent sinus infection.

6. The clinical examination alone is able to give positive proof of active sinus disease, and that only if pus be seen coming from the ostium of the sinus.

7. The clinical examination frequently overlooks chronic disease, especially of the ethmoidal and sphenoidal groups, if there is no abnormal secretion in the corresponding drainage areas, and the mucous membrane as seen by the nasopharyngoscope shows little if any change.

8. It is, therefore, desirable that patients with suspected chronic sinus disease be reëxamined several times before a negative clinical opinion is given.

9. The clinical examination will find at times the evidence of past sinus disease, although not as frequently as the roentgen rays.

10. Transillumination findings are at times falla-

cious: polyps or mucoid secretion may transmit light normally; pathologic change due to former sinus disease or normally thick bone may be wrongly interpreted in terms of active disease.

11. Neither method is, therefore, to be relied upon alone: both must be used routinely in the study of patients with suspected sinus disease.

12. A positive finding in suspected chronic cases by either method of examination justifies the statement that a sinus *may* be, but not that it *is* actively diseased, except in the presence of pus or polyps.

13. In asthmatics a positive finding by either method of examination not only justifies but indicates the opening of the affected sinus.

14. Sinus disease is extremely prevalent in patients of all ages.

[We would commend the careful work done in the observations recorded. The *x*-ray examination is a valuable adjunct to the clinical examination. Both transillumination and the skiagraph often bring to light evidences of frontal or maxillary sinusitis where the clinical examination hardly creates a suspicion of trouble. The recognition, either by skiagraph or by transillumination, of a shadow, for example, over the maxillary region does not necessarily imply an active process. Such shadows remain indefinitely, as a residue of thickened membrane after the active inflammation has long since subsided.

An important question arises. Have such thickenings, in the absence of pathological secretions such, for example, as can be demonstrated by irrigation, any clinical significance? Or, shall we say, any more significance than similar changes in the mucosa of the nasal passages? We are inclined to believe that alterations in the mucosa of the antrum, for example, are not likely to have any clinical significance whatever, unless there is an active discharge which can be demonstrated by irrigation. An exception may have to be made where a patient is an asthmatic. This point has not yet been made clear. To

advocate the operative removal of a thickened mucosa, even with polyp formation in the antrum, simply because one can diagnose such a condition, seems hardly to be justified in the absence of any clinical significance indicating that they are causing any annoyance. It seems to us about as logical to propose the exenteration of the thickened polypoid mucosa of the nasal passages in chronic rhinitis as to peel out the chronically thickened membranes of the sinus. We operate on the thickened mucosa of the nasal passages producing polypoid degeneration and mucous polyps when their presence produces annoyance to nasal respiration: we operate not with the hope of curing the disease, but only with the expectation of relieving the patient from one of the annoying symptoms. No such justification exists for an operation upon the thickened membrane lining the sinuses. Such conditions do not interfere with respiration, and may not be a source of any annoyance.

Systemic infection in sinus disease is an uncommon occurrence, and it is perhaps no more frequent than systemic infection from a chronic nasaopharyngitis. It is the buried form of infection, such as one finds in the tonsils or about the roots of decayed teeth, which are prone to cause systemic disease. The last word regarding the non-secretory forms of sinusitis has not been said, but we would deprecate the tendency in some quarters for advising operation upon the sinuses because the patient has systemic infection, and where examination fails to reveal any definite evidences of an active sinusitis, that is, one producing pathologic secretions. We are not convinced that the diagnosis of a sinusitis made by examining the returned fluid from irrigation by centrifuging this fluid, and counting the cellular elements, has any clinical significance.—Ed.]

Conservative Modification of the Lothrop External Frontal Sinus Operation. Two illustrative cases are reported by F. R. Spencer[7]. His completed operation

(7) Arch. Otolaryng., May, 1929.

differs from Lothrop's in that: (1) the opposite sinus is not opened. (2) the upper part of the septum is not removed. (3) the opening into the sinus is all above the bridge, instead of below, and (4) the burrs are used from above instead of from below through the nose. These modifications give the technic greater usefulness, especially when only one frontal sinus requires opera-

Fig. 58.

tion; and a better view of the operative field is thus obtained.

A Gigantic Frontal Sinus Requiring External Operation: Case Report. This case was reported by H. W. Lyman[8] because it proved to be the largest frontal sinus of which the author was able to find any record. X-ray plates (Figs. 58, 59) showed the frontal sinuses extending upward 9 cm. above the orbital ridge and outward and backward 4 cm. beyond the outer edge of the orbit,

(8) Ann. Otol. Rhin. & Laryng., December, 1928.

the approximate width of the sinuses being 10 cm. The greatest depth of the sinuses from the anterior to the posterior wall was 1.8 cm.

The patient was a young man, aged 29. The nasal complaint requiring sinus operation was a profuse dis-

Fig. 59.

charge from the left frontal sinus, and severe pain over and around the left eye. Previously the left sphenoid and ethmoid cells had been opened. The author decided upon the Lynch operation and accordingly an opening was made through the orbital roof into the frontal sinus, care being taken not to penetrate the mucous membrane lining the sinus. This opening was extended inward in

the usual manner and outward to the extreme limit of the orbit, and carried backward until the posterior wall of the sinus was encountered. The orbit was found filled with polypoid tissue and pus, the outer half of the sinus forming a huge abscess cavity with pus under pressure. The contents of the frontal sinus were then removed. This was an exceedingly tedious process, because of the tremendous size of the cavity and the difficulty in curetting the margins of the cavity around the convexity of the frontal lobe of the brain. The Coakley curettes, ordinarily used for this purpose, were too short to reach the boundaries of the sinus cavity, and it was necessary to use uterine curettes with malleable shafts, which could be bent to extend around the convex contour of the inner wall of the sinus, both vertically and horizontally. The breaking down of the septae in the upper part of the sinus, which, if left, would have interfered with proper drainage, required considerable care and a great deal of time. Fortunately, the posterior wall of the sinus was intact. The removal of the nasal process of the superior maxillary, the lamina papyracea, the ethmoid cells remaining after the intranasal operations, and enlarging the opening of the sphenoid, presented no especial difficulties.

Postoperative recovery was slow, but satisfactory. The nose became dry and healed. Diplopia was noticed for a considerable time and some difference was noted in the two eyes, the left eyeball being considerably deeper than the right one.

[Exceptionally extensive frontal sinuses present one of the anatomical variations which require the exercise of careful judgment when it comes to the question of operative treatment. In the first place, an extensive operation upon any frontal sinus is justified only when efforts to enlarge the nasal openings sufficient to relieve the patient of the symptom of pain fail. As a matter of fact, most cases of chronic frontal sinusitis are relieved of this troublesome symptom by intranasal operations and, at

the same time, are relieved of the menace that exists in such cases of possible intracranial complications. If one should be reluctant to carry out an external operation on the frontal sinus of ordinary size, there should be unusual reluctance in undertaking to do an external operation for the relief of a chronic frontal sinusitis with a skiagraph showing an unusually large sinus. And here,

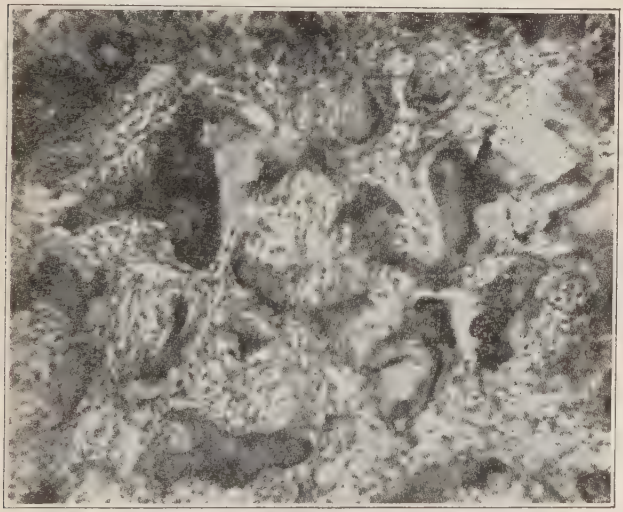


Fig. 60—The portion of solid connective tissue in the mass of the osteoma. Right, connective tissue; left, bony mass of osteoma. Case 2.

especially, we would advocate persistence in efforts to secure proper drainage and ventilation through an intranasal operation. The reasons are obvious. The deformity which results from operation in such cases is particularly disfiguring. I have been surprised to find how often cases of this sort operated on by an intranasal method with substantial relief of the dangerous symptom (that of headache) turn up in later years with a complete cessation of all discharge. A thickened polypoid mucosa,

is, we feel certain, no counter-indication to the intranasal operation.—Ed.]

Pathogenesis of Osteomas of the Nasal Accessory Sinuses. On the basis of his histological study A. Fetissof[9] believes that the growth of the osteoma takes place from the inside outward by the metaplasia of fibrous tissue into bone tissue. The osteoblastic ossificatory process

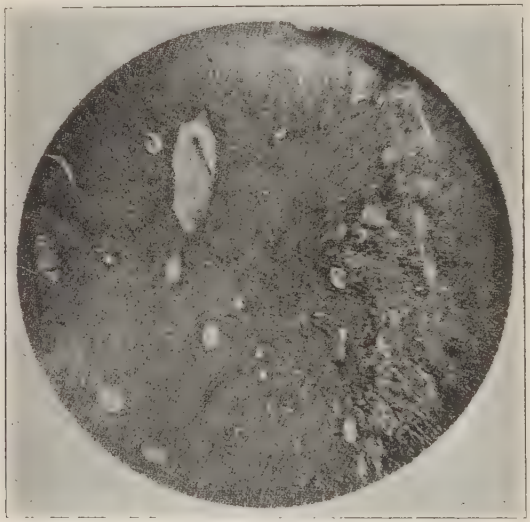


Fig. 61—Osteoma No. 3. Bony islets of various shape, locally fused with each other. Between them mature connective tissue.

that takes place at the periphery of the osteoma plays a secondary rôle in the growth of the tumor.

The fibrous tissue filling the interstices of spongiose bone is the direct continuation of the periosteum covering the osteoma from the outside. The theory of origin of osteomas from the periosteum, split off at the stage of the development of the organism of the periosteum, is the most fundamental. (Figs. 60 and 61).

(9) Ann. Otol. Rhin. & Laryng., June, 1929.

How and When the Mucous Membrane of the Maxillary Sinus Regenerates: An Experimental Study in the Dog. C. D. Knowlton and G. W. McGregor[1] removed the mucous membrane lining the antrum in three dogs, killed at various intervals postoperatively, and microscopic study of the antrum tissues was made. The experiment showed the following results:

1. Anatomically and histologically, the dog's antrum is well adapted for experimental study.

2. One month after the antral lining is removed, epithelial regeneration is well established, and bone formation begins.

3. Three months afterward, epithelial regeneration is complete, and the canine fossa opening is nearly filled in with bone.

4. Five months afterward, gland regeneration is well established, and the mucoperiosteum as a whole looks almost normal.

5. The human antral sections thus far examined show that the same processes occur in man as are here shown in the dog.

The article is well illustrated with microphotographs.

Considerations For and Against Curetting and Exenterating Sinus Operations. It has been observed in dogs that excision of the antral wall and removal of the mucosa is followed by complete return to normal of the tissues and structures involved. This must be compared with observations of radical operations on human beings, or with the statement of many observers, whose findings include cicatricial basement membrane, squamous and cuboidal epithelium, vestiges of glands, general fibrotic changes, and more or less complete obliteration of the stomata and subepithelial lacunae.

E. R. Lewis[2] states that what he has to say must not be understood as a disapproval of all surgery of the nose. Conservative surgical procedures cooperating

(1) Arch. Otolaryng., December, 1928.
(2) Ann. Otol. Rhin. & Laryng., September, 1929.

with natural defense and healing processes frequently prove of tremendous value; in critical conditions they may turn the tide, averting a fatal outcome, by timely venting of purulent accumulations. Granulomata, polyp, fibrotic adhesions, synechiae, septal abnormalities, traumatic disturbances of normal relations and other conditions demand surgical therapy if one is to pursue the rhinologic ambition to restore normality. Lewis is a staunch advocate of nasal surgery, provided it is conceived logically and executed conservatively. But thousands of noses have been and are still being operated upon because of nasal reactions to general allergic states; it would be as logical to excise a crop of hives and far less disastrous. There is no necessity for mentioning the numerous instances of radical operations inadvertently opening up portals of infection with resulting septicemia, osteomyelitis, sinus thrombosis, meningitis, brain abscess, metastatic pulmonitis, cellulitis and other complications far more serious than the original "sinus trouble." If these patients were playing for a possible cure it would not be quite so bad, though the odds would be pretty uneven. But they are risking serious or fatal complications with no chance of cure, even if they succeed in avoiding complications.

Radical surgery of the nasal sinuses not only fails therapeutically; it frequently is responsible for additional injury to the patient. It takes no cognizance of tissue recoverability of inflamed or irritated nasal tissues, but encompasses their surgical destruction together with other essential cells not even involved by disease at the time of operation; it respects not the integrity of mechanical arrangement of nasal structures, but intentionally accomplishes profound disturbance of fundamentally essential relations of working parts of the respiratory mechanism.

[We commend the sentiment of this article. If the surgeon, before recommending operative interference on a typical nasal condition, or suspected disease, would ask

himself the question whether under the existing circumstances he would care to have the operation performed upon himself. the number of such operations would diminish materially.—Ed.]

An Operating and Visualizing Sinuscope. S. Morse[3] has felt the need of an instrument which would be useful in visualizing the openings of the various sinuses, and in probing them under direct vision. He thought also that it would be feasible to insert such an instrument within a sinus like the antrum or sphenoid.

There have been, to the author's knowledge, only two instruments which have made a step toward progress in this direction. In the antrascope of Spielberg the principle of the nasopharyngoscope was applied to a cannula, and one was able to insert the instrument into the antrum and to visualize at right angles only. This instrument did not have any operating possibilities. Another instrument by Maltz was an improvement over Spielberg's instrument and had a little more than right angle vision (20 per cent) and had the advantages of a narrow lumen. This also did not have any operating possibilities.

The practical uses for the author's instrument are viewing, probing and instilling the sinus orifices, thorough eradication of chronic ethmoiditis and polyps, making strong topical applications directly under view and visual implantation of radium in the eradication of chronic polypoid degeneration.

In the treatment of patients with intractable disease of the antrum, the instrument may be inserted into the cavity through its accessory channel, or it may be used through a permanent opening made by one of the usual instruments for that purpose. It can be used repeatedly through this opening for injection of fluids, fulguration within the cavity and for removal of polypoid masses, with an instrument similar to the dental broach which the author has had prepared for himself and

(3) Arch. Otolaryng., March, 1929.

which he has used experimentally on other polyps with satisfactory results.

The instrument has proved of great value because of its "direct in line vision," in postnasal work, making possible the recognition of the origin of postnasal

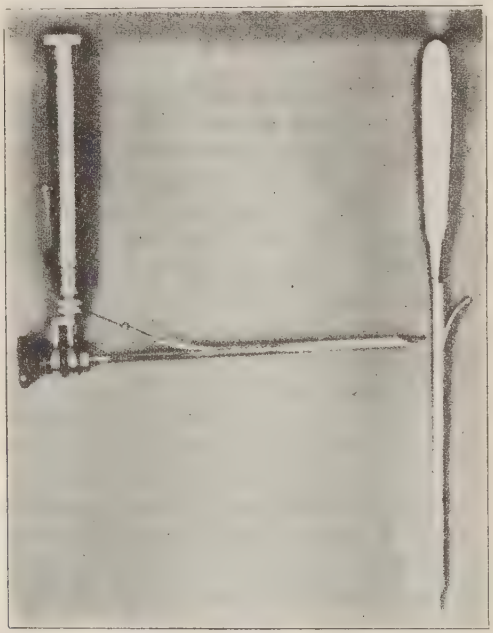


Fig. 62—The instrument on the left is the antrum trocar in sheath; that on the right, the sinuscope in sheath.

discharge, old unhealed ulcers resulting from the removal of adenoids, and a good view of adenoid masses and hypertrophy of the posterior tip of the inferior turbinate. These areas may be treated or operated on with the instrument in situ, as, for example, by fulguration, by radio knife work and by snare.

The instrument may also be of value in attacking the hypophyseal tumor through the nasal route according to the method of Cushing. (Fig. 62).

The outstanding features of the instrument are: (1) There is a visualizing prismatic arrangement of its almost flylike eye so that one looks forward and to the sides with the light in front; in fact, one sees through the light. This principle is adapted from the McCarthy panendoscope but is modified to suit the purpose. (2) A large field may be seen in a small area or a small field in a large area, according to the distance of the end of the instrument from the spot viewed. (3) The displacement of the area may be viewed up or down or laterally, by rotating the tube without moving the instrument up or down. (4) An erect image is presented. (5) Cold illumination with a porcelain tipped bulb is used to prevent injury to the tissues. (6) The instrument may be revolved within the sheath to get the operating instrument into view. (7) There are: a trocar attachment for entering the antrum, with the sheath, operating instruments, catheter, fulguration electrode for fulguration, cutting or zinc ionization within a cavity, probes, broaches and rasps. The two latter are being perfected. With the snare attachment hypertrophy of the posterior tip of the inferior turbinate may be removed under view.

From his experience with the instrument the author believes it is of great value as an accessory to *x*-ray and transillumination methods. In a case of sphenoiditis the condition was diagnosed by visualizing the discharge from the spenoidal openings; this was corroborated by the *x*-ray picture.

As an aid to mapping out the extent of the sinuses, one can inject any one of the opaque *x*-ray fluids with a small uretheral catheter through the sinuscope.

As an aid to further convenience in the use of the sinuscope, the author has arranged to have the caliber of the visualizing tube reduced by 0.25 mm., which he has been informed is possible. This will aid considerably in inserting the instrument in some of the small nasal passages that are seen occasionally.

The Formation and Histologic Structure of Cysts of the Maxillary Sinus. Secreting dental and mesothelial cysts commonly occur in the maxillary sinus and are frequently seen on *x*-ray examination. They may be single or multiple and may vary greatly in size, sometimes nearly filling the antrum. From his histopathologic study G. W. McGregor[4] has found that they are all in-

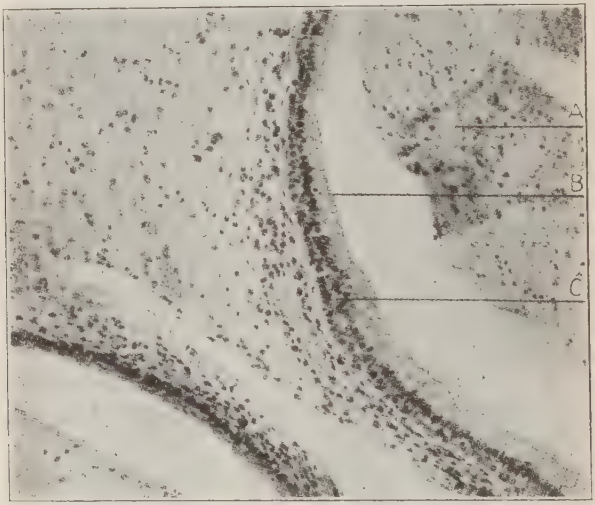


Fig. 63—Secreting cyst lined by tall columnar epithelium with damaged cilia. The contents show many polymorphonuclear neutrophils. A indicates the contents of the cyst; B, the damaged cilia, and C, the epithelial lining.

fectious in origin and occur only in the presence of a pathologic process. Damage to the cilia of the gland tubules by infection is the primary cause of secreting cysts. Edema, infiltration and fibrosis may be contributing factors.

The lining epithelium of secreting cysts undergoes various pathologic changes (Fig. 63).

Dental cysts arise from epithelial rests which remain after the development of the teeth and which become

4) Arch. Otolaryng., November, 1928.

stimulated into activity by infection. They may contain large cells known as clasmatocytes, which are derived from monocytes, and which have great phagocytic powers. Possibly a tuberculous factor may be present.

Mesothelial cysts occur in edematous mucous membrane and are due to the accumulation of tissue fluids in the tissue spaces. They have not a truly formed wall.

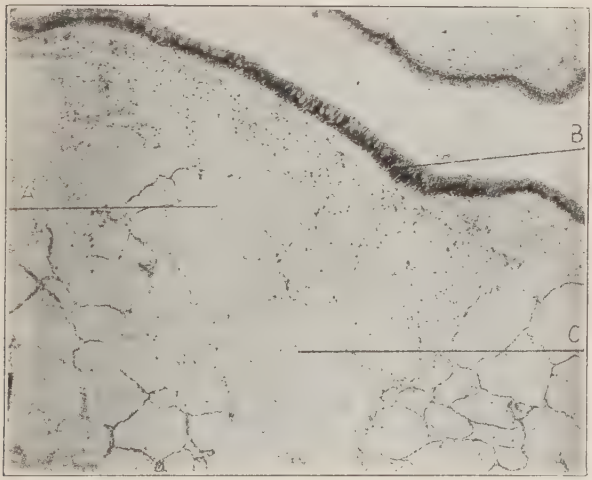


Fig. 64—Precystic stage of mesothelial cyst formation, showing tissue spaces greatly dilated. Some of their walls are beginning to break down. A indicates a large tissue space; B, epithelial layer of the edematous mucous membrane, and C, two tissue spaces converted into one.

The edema is due to a disturbance in the water-balancing mechanism, caused by infection (Figs. 64 and 65). The cysts are filled with tissue fluids, while secreting cysts are filled with mucus. Any one of these cysts may harbor infection and may act as a focus of infection.

Chronic Hyperplastic Sinusitis (Antral): Report of Cases. It is the belief of T. R. Gittins[5] that chronic sinusitis of the hyperplastic type exists much more com-

(5) Ann. Otol. Rhin. & Laryng., December, 1928.

monly than is generally believed. The absence of the usual symptoms of sinus disease and negative irrigations are probably the important factors in confusing the diagnosis and treatment. Recurrence of nasal polyps, hyperesthetic rhinitis and various general disturbances can very frequently be traced to hyperplastic antrum infection. *X*-ray alone or with the aid of radiopaque substances often offers the only positive diag-

Fig. 65—Two small mesothelial cysts being formed into one. A indicates the intercystic wall breaking down; B, the epithelial layer of the mucous membrane and C, the wall of the cyst.

nostic procedure before exploration of the sinuses. As a rule, these hyperplastic antrum infections can be classed as masked, comparable to mastoiditis, as it appears especially in infants with gastrointestinal troubles. Three cases are reported not because they represent any rare condition, but because they tend to emphasize several different phases of this subject.

Case 1 presented an exaggerated instance of chronic hyperplastic antrum infection wherein the polyp formation, besides filling the antrum, eroded through the nasal wall of the sinus. It extended on through to the naso-

pharynx, completely obstructing this space, and becoming strangulated gave the clinical symptoms of malignant tumor or gumma.

Case 2 had the record of a severe arthritis of rather long standing. Numerous attempts had been made to eliminate foci. Tonsils and dead teeth had been removed, and the nose and sinuses had been pronounced negative several times, mainly because there was no discharge in the nose or throat, no history of head colds, and a blurred right antrum had been negative on irrigation. A radical antrum operation disclosed the cavity completely filled with degenerated polypoid material. A very rapid cellulitis developed in the tissues of the right face and neck the next day, with a fever of 104. Many joints became swollen and painful, and the clinical course was stormy for most of a week. No pus developed in the antrum cavity or around the sutures. After the acute reaction subsided there was a marked and rapid improvement in the arthritis and in the general physical condition. This improvement has been so permanent that now, a year after the operation, the patient is continuing her nurse's training, where before she was practically bedridden. Apparently the reaction following the operative procedure served the same purpose as that obtained from a foreign protein, but with a better result in this instance because the protein was specific.

In case 3, a masked hyperplastic bilateral antrum infection was found in a very severe case of bronchial asthma. Medical examination and pollen tests had revealed nothing, and at the time of the sinus examination the patient was taking hypodermic adrenalin 6 to 12 times every 24 hours. Here again the nasal history was negative. There was no discharge in the nose, and nothing was obtained on irrigating the antra, although they were blurred in the *x*-ray picture. Several irrigations on different days were negative. A radical antrum operation disclosed infected hyperplastic tissue

in both antra, with marked involvement of the right one. Within two days after the operation adrenalin injections were not necessary and have not been used for the three months since the operation. Apparently the asthma has completely disappeared, but it may be that it is only a temporary improvement. At least, eliminating the masked hyperplastic antrum infection, completely altered the clinical picture for three months after all other measures except large doses of adrenalin had failed to give any relief in over a year of treatment. The object in reporting this case is not to claim a cure of asthma, but rather to stimulate a more diligent search for this type of sinus infection in such cases.

[We find ourselves in accord with the writer, that masked sinusitis is not an unusual condition, but where this condition is not associated with asthma, or where there is no evidence of any systemic infection, we have our doubts whether, in the absence of any pathological secretions, on irrigation, a positive indication exists for radical surgical interference.—Ed.]

Dental Caries in Paranasal Sinus Infections. G. Berry[6] believes that although sinus infections are sometimes found in young persons, they are much more frequent in persons in the prime of adult life. This is not a period when the anatomic nose is growing or changing and thus impeding sinus drainage, unless external traumatism is superimposed; the tonsils are offending no more, or but little more, than in adolescence; senile infirmity has not yet set in; hay-fever and asthmatic sensitiveness should not have changed and the patient is usually in fairly rugged health. These factors alone do not adequately explain the higher incidence of sinus infections. On the other hand, the teeth are decaying during this period. They are anatomically in close proximity. Advancing dental caries sooner or later does reach the pulp chamber, and the easiest path for an infection caught under the filling or crown is

(6) Arch. Otolaryng., December, 1928.

up through the dental canal to just beneath the antral floor. The roentgen ray has been relied on to reveal a dental abscess. The author's contention is that the relatively prompt discharge of this infection into the antrum stops the bony resorption which one looks for in the film; and that in this type of case, unless new methods for diagnosis become available, it is the rhinologist, working with the dentist and roentgenologist, who will determine whether harm is resulting.

A dead or dying tooth in close proximity to the antral floor, no matter how harmless it appears, is a threat. Recurring pains in the antrum on this side, an occasional seepage of pus from the middle meatus, small polypi in this region and even a chronic unilateral nasal congestion otherwise unexplained, should attract attention to the teeth or to a possible buried root. The observation and removal of such a nearby septic focus will clear up many a stubborn nasal and paranasal condition. This claim is reasonable and it has the support of experience.

[The author does well to call attention to the careful examination for disease about the roots of the upper molars in all cases of chronic antrum disease. An important question is, whether such an infection is capable of producing antrum infection where the abscess about the root has not actually perforated into the sinus. Unfortunately, skiagraphs cannot clear up this point for us. The proper procedure is very clear. If a patient has chronic sinusitis and there exists an abscess about the upper molar tooth, the latter should be removed and the antrum operation deferred at least for the time.—Ed.]

Advantages of External Route in Operative Treatment of Chronic Maxillary Sinusitis Diagnosed by X-Ray. In this procedure described by J. B. Farrior†, a sufficient opening is made in the anterior wall of the antrum to allow free inspection and ease of work. The pathological conditions are dealt with as seen. An intranasal opening is made in the inferior meatus anterior to

(†) Southern M. J., November, 1928.

the limit of the antrum extending half way back. Iodoform pack is placed loosely or tightly as the condition requires, the free end being in the inferior meatus. The wound is closed with one suture. Ten to fifteen minutes are usually required for the operation.

The author regards the external route operation as the most satisfactory because it offers the only way to deal with the conditions under direct vision. It is easy for the surgeon and it is not an ordeal for the patient. He is more comfortable after a double external operation than after any other sinus operation, after a submucous resection, or a tonsillectomy.

One should forget the word "radical," because many hold the view that it means to "tear out" the entire mucous membrane of the antra. By seeing all parts through the external operation and taking care of diseased areas only, one does a wiser thing than by operating blindly through the intranasal route.

[The key to the cure of most cases of chronic antrum infection is the securing of a sufficiently large opening into the nose. This can be most easily obtained in the inferior meatus. In some cases, the middle meatus offers the best region. An intranasal operation which successfully establishes such an opening, accomplishes the same purpose as the more radical procedure by the external route.—Ed.]

An Antro-Ethmosphenoidal Operation. The indications for this operation according to F. M. Turnbull[7] are:

1. Primarily, this operation is especially suitable in cases of chronic, advanced pansinusitis which have resisted all efforts at palliative treatment.

2. The operation can be used successfully when extensive disease conditions of the ethmoids or sphenoids exist which cannot be reached from within the nose without great destruction of parts.

3. When ocular complications dependent on patho-

(7) Arch. Otolaryng., March, 1929.

logic conditions of the ethmoid and sphenoid sinuses occur, the operation is suitable.

4. It is successful when roentgen examination shows infection of the suborbital ethmoidal cells.

5. The operation can be employed in removal of a foreign body, such as a bullet, from the ethmoid or sphenoid sinuses.

The operative work is done entirely under local anes-

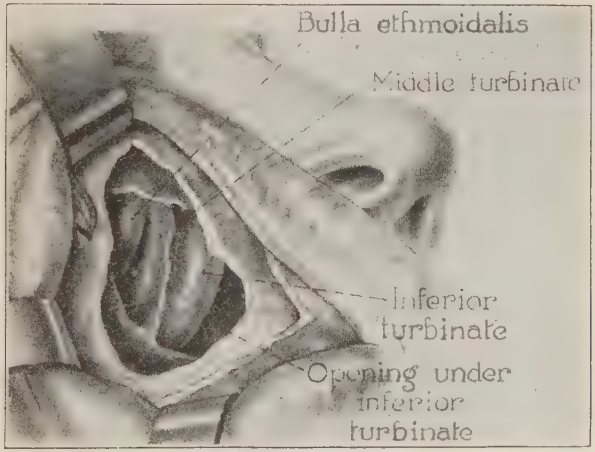


Fig. 66—Completed excision of naso-antral wall with exposure of bulla ethmoidalis.

thesia. The first surgical step is to open the antrum. The incision is made high, at the apex of the facio-alveolar fold. The anterior wall of the antrum is then well removed. Following this the naso-antral wall is removed as shown in Figure 66. The antrum is cleaned out, as indicated, at this stage.

To open the ethmoidal capsule the bulla is located (Fig. 66). This may be opened with a Mosher curet or with biting forceps. The direction of force is parallel to the orbit, and at no time is pressure exerted on the orbital plate. The walls of each cell must be carefully

removed, care being taken not to leave crushed bone or particles of bone attached by membrane, as these form obstructions which may impair drainage. All ethmoid cells in front of and behind the nasofrontal duct must be thoroughly removed so that the drainage from the frontal sinus will be unobstructed. The future of the drainage of the frontal sinuses will depend on complete removal of these cells.

In dissection of the anterior ethmoid cells at the angle of the orbit, one will usually find some ethmoid cells extending outward under the floor of the orbit. These suborbital cells usually extend from one-fourth to one-third of the distance of the orbital floor. This is found so constantly that it is regarded as a normal position of these cells. Occasionally, these suborbital cells extend half way across the floor of the orbit, and the author has seen them extend the full width in three cases. These cells are easily reached from this approach and can be dissected without injury to the eye. These suborbital ethmoid cells, if present, usually empty into the antrum and are a frequent cause of continued infection of the antrum and changes in the eye after an intranasal ethmoid operation has been done. The position of these suborbital cells can be seen in the roentgenograms, even in the flat plate.

Posterior Ethmoids.—The dissection is then carried backward through the posterior ethmoids, the ethmoidal septums and the nasal wall of the ethmoid labyrinth being removed and this dissection being carried from the middle to the superior fossas external to the middle turbinate but without disturbing the anterior and posterior attachments of the latter. This will accomplish the desired effect of removing all extra cellular and intracellular polypi; it will open and drain all closed empyemas of the cells of this region and, if the intercellular walls are all removed, will provide permanent drainage in this locality.

Sphenoid Sinuses.—The foregoing procedure will have

exposed the anterior wall of the sphenoid sinus which lies directly back in the depth of the wound and which may be recognized by its slightly bulging convex surface, the somewhat hollow sensation it gives on tapping and usually by the presence of its osteum. This anterior wall can be opened by a curet, not necessarily through the osteum, to permit entrance of a right angled biting forceps with which the anterior wall is removed downward and laterally until all the anterior wall has been removed. Particular stress is laid on removing this anterior wall until it is flush with the floor. The contents of the diseased sphenoid sinus may now be removed, whether they are polypi, septums, pus or simply diffuse degeneration of the lining membrane. Bleeding has not been a source of worry here, but if it occurs it can be controlled by crushing the bleeding point against the bony wall with blunt forceps.

The operation is finished by simply allowing the edges of the wound to fall together. Packing is not usually introduced, as it has rarely been found necessary. Stitches are not used, the natural folds of the tissues of the cheek holding the edges of the incision in place. Inspection of the interior can be made during the next twenty-four hours if deemed necessary. The patient usually leaves the hospital on the fourth day.

The author completes the operation in less than an hour. He has not had a single case where the upper teeth were devitalized by his procedure.

The Effect of Sinusitis on Certain Syndromes of Chiasmal Tumor. In this article H. I. Lillie and W. I. Lillie[8] note that the symptoms for which operation is performed on paranasal sinuses are certain disturbances of vision and headache of obscure origin. In fact, so much had been written about the possibilities of relief from operations on the ethmoid and sphenoid sinuses, that rhinologists have explored these sinuses in the hope that symptoms would be relieved and in the

(8) Laryngoscope, December, 1928.

fear that, if the operation was delayed or not performed, blindness, particularly, would result. In defense of the rhinologist, therefore it could be said that he was placed in a predicament.

Fortunately, as is usual in the practice of medicine, this wave of enthusiasm has been supplanted by one more conservative, largely because of the reported co-operative experiences of rhinologists, ophthalmologists and neurologists, which has made for better undersanding of the indications for intranasal operations. Unfortunately, the earlier symptoms of brain tumor may be vague and obscure and a definite diagnosis is not possible until after a period of careful observation. It is in this group of cases that many operations on the posterior paranasal sinuses are performed intranasally. Headache and its significance will remain difficult to interpret and evaluate properly and for this reason, possibly, patients are and will be frequently subjected to intranasal operations in the hope that the distressing symptoms may be relieved. The type of headache which is due to intranasal causes has, however, been fairly well established and it is the experience of rhinologists generally that operations for their relief are usually successful. Operations for the relief of headaches of obscure origin are more than likely to add new symptoms to the old. It is too much to expect that headache due to migraine, eye strain, toxemia and brain tumor, can be relieved by intranasal operations. In a review of cases of proved brain tumor at the Mayo Clinic, it has been found in a relatively high percentage that intranasal or pharyngeal operations have been performed recently.

Paranasal sinus disease undoubtedly affects the optic nerve in certain cases; the ophthalmologic and rhinologic observations are quite characteristic. The same may be said of chiasmal tumor from the ophthalmologic standpoint, but the rhinologic data are not characteristic.

Retrobulbar neuritis, as is produced by paranasal sinusitis, is usually unilateral. Either all vision is lost suddenly, or the central vision is considerably diminished; this may be progressive for a short period, or may appear in episodes, with regression of symptoms. The ophthalmologic syndrome is characteristized by complete unilateral amaurosis, or by unilateral central or cecocentral scotoma, and a normal fundus. In a certain percentage of cases true optic neuritis has been observed in conjunction with the foregoing field defects. Tumors near or at the optic chiasm can produce such an opthalmologic syndrome, but the onset is usually insidious, and loss of vision is slowly progressive, although fluctuations are not uncommon. The usual perimetric findings are bitemporal scotomatous or peripheral field defect. The fundi are either normal, or both disks exhibit a definite, full, waxy pallor before simple optic atrophy develops. The authors believe that a definite progression of signs and symptoms, for a certain period of progression, followed by a period of definite regression, is characteristic of inflammation. When a combination of the two, inflammation and tumor, is encountered, the correct interpretation and the proper therapeutic management may be difficult.

The authors have observed cases in which it was finally shown that the inflammation and tumor combined were affecting the optic nerve and it was difficult to interpret and evaluate these observations, particularly in the presence of inflammation.

The seven cases discussed fell into two main groups: those in which operation on the intranasal pathologic processes did not change the symptoms, and those in which such operation afforded temporary relief of the visual symptoms.

[The nasal cause for headaches has been the subject for consideration for many years. In times past it was believed that headaches resulted from anatomic irregularities whereby the spur of the septum impinges on the

outer nasal wall. The cause for many headaches still remains obscure, and very naturally the rhinologist seeks to make sure that there is no nasal condition, the correction of which would relieve the disturbing symptom. In connection with the nose and headaches, two factors should be kept in mind: one is that the symptom of headache is not common, in chronic sinus disease. The second is that most headaches have nothing to do with sinus trouble.—Ed.]

The Present Status of Intranasal Operations for the Relief of Involvement of the Optic Nerve. To amplify his limited experience and to help in this discussion, Drs. Mosher, Skillern, Hurd, Beck and Lynch have recently been kind enough to favor R. A. Fenton[9] with brief comments based on their extensive work in this field. They have all seen numerous patients in whom the optic nerve was involved and in whom the visual disturbance was relieved by operation. Mosher, who now rarely operates in this region, cited the operative results of Leon White, stating that the latter always eliminated dental and tonsillar sepsis before attacking the sinuses. (This seems an order generally adhered to in the United States.) Hurd also emphasized dental sepsis, and Lynch that from tonsils. None of them found that medical treatment of the nose gives more than passing help.

Agreeing with the observations of European pathologists, these observers find the gross pathologic changes slight, if visible at all; a purulent, draining sinusitis is almost never present. Skillern found closed (or practically closed) cavities, which contained an acrid serous secretion rather than pus. Hurd and Lynch remarked on the low intensity of this ethmosphenoiditis without pus. Beck found little change on microscopic examination, even of tissue removed in his most startling case fifteen years ago; the patient was led in to him practically blind, and now has 20/30 vision. He maintained

(9) Arch. Otolaryng., June, 1929.

that blockage of a sinus without clinical manifestations is responsible for severe edema of the optic nerve sheath, and that operation lessens this dangerous edema. The whole matter was recently presented before the Chicago Ophthalmological Society, and the question became greatly confused because tobacco amblyopia, pseudodiagnoses of multiple sclerosis, and like causes of disease of the optic nerve were brought into the discussion. Obviously, the ophthalmologist does not have accurate means of distinguishing between the appearances of the visual fields and the fundus caused by these various neutral disturbances and must turn to the rhinologist, the dentist, the serologist and the radiologist for help.

Skillern advised resection of a large portion of the anterior sphenoidal wall and of those posterior ethmoidal cells nearer to the sphenoid; this is also the practice of Beck, Lynch and Hurd. The necessity for work on the septum is stressed by Beck, who avoids simultaneous work on the antrum and frontal sinus if possible. Lynch reported one case of blindness in which middle turbinectomy alone effected a cure.

None of these men had ever seen a patient in whom an intranasal operation seemed to make the eyes worse; and they agreed that imminent blindness is an indication for radical operation on the ethmoid, the sphenoid or both, and is a challenge to surgical judgment. Rare though these cases may be, they offer much greater hope of cure than any other sort of optic neuritis, if diagnosis and operation are not delayed.

The consensus of present American opinion would thus seem to favor intranasal operation for the relief of optic neuritis caused by congestive lesions of the posterior group of nasal sinuses. Such an operation should be only so radical as to secure decongestion, aeration and release of pressure but not so radical as to invade, traverse or inflame otherwise uninvolved structures. Surgeons performing radical and conservative operations have claimed equally brilliant results.

[Optic neuritis is such a serious matter that the rhinologist is quite willing to give the patient the benefit of the doubt. Even where a careful examination may not reveal definite evidences of sinus disease, he may still be willing, if the opthalmologist so desires, to carry out operative procedures for the ventilation of the posterior ethmoid and sphenoid in the hope that some disease in these regions may be relieved and thus bring about a cure of the optic neuritis. That optic neuritis may occur as the result of some acute infection in the nose which produces no demonstrable disease of these cells, seems probable. It has been urged that the earlier the operation, the more likely beneficial results. As a matter of fact, such cases will often recover without operation, and a favorable result, therefore, after an operation where nothing was demonstrated, could hardly be accepted as evidence that the operation was responsible for the recovery.—Ed.]

Retrobulbar Optic Neuritis. Scheerer[1] states that, in the past seven years, he has seen 200 cases of retrobulbar neuritis, of which at least 55 per cent were caused by multiple sclerosis. From 4 to 10 per cent were definitely due to disease of the nasal sinus, and from 15 to 20 per cent were suspected of originating from disease of the nasal sinus. The rest resulted from general causes. In considering retrobulbar optic neuritis, he states that in numerous cases the disease of the optic nerve is the first sign of multiple sclerosis. In regard to those cases that are due to disease of the nasal sinus, he states that the interpretation of the clinical picture in cases presenting symptoms of sinus disease is frequently more difficult in the cases in which multiple sclerosis is obviously present. The rhinologists are not unanimous in regard to the significance of these changes.

The author raises the question, which others also have raised, whether disease of the nasal sinus does not prepare the ground for the development of multiple sclerosis, and he states that actually there has been a series

(1) Arch. f. Augenh., July, 1928.

of cases in which, in spite of successful operations on the nose, multiple sclerosis later developed. Of 27 cases observed in 1927, six showed disease of the nasal sinus. The author briefly reports these six cases, the majority of them being typical cases of retrobulbar optic neuritis originating from disease of the nasal sinus. He reports also, briefly, a case with undoubted symptoms of multiple sclerosis, with a clouding of the nasal sinuses shown on roentgen examination, and another case that showed the typical evidences of retrobulbar neuritis of nasal origin, in which the operative outcome apparently was successful, but in which the patient died later, obviously of multiple sclerosis.

He mentions a third cause for the symptoms of retrobulbar neuritis, namely such general causes as circulatory disturbances, etc. He speaks about the so-called reflex neurosis, or vascular spasms, and advises that in all cases of retrobulbar neuritis one should wait as long as possible before operating, and should always think of the possibility of multiple sclerosis.

Retrobulbar Neuritis. In discussing the importance of the marrow spaces as the route for infection from the sinus mucosa to the optic nerve, H. Herzog[2] points out that this case shows at least that it is possible for sinus inflammation to reach the intracanalicular portion of the optic nerve by the route through the marrow spaces. He states that his conception of the cause of retrobulbar optic neuritis of nasal origin is a circumscribed serous meningitis which spreads to the optic nerve from the diseased sinuses by means of the marrow spaces.

If a chronic nasal suppuration exists, treatment consists in the removal of the disease of the sinus. Herzog seeks the procedure for those cases which do not show definite disease of the nasal sinus, but which do not exclude a nasal focus. He can imagine the objections of the rhinologist to surgical intervention in sound tis-

(2) Arch. f. Augenh., July, 1928.

sue. Must the rhinologist submit to the dictate of the ophthalmologist and intervene surgically when the ophthalmologist has exhausted every other means of combating the condition, and when the last hope lies in nasal therapy? Another way than surgical intervention to obtain beneficial results is by what the author terms Daueranämie or prolonged anemia. This anemia is produced by means of pledgets of epinephrin inserted into the middle meatus after infraction of the middle turbinate. The pledgets are inserted along the posterior angle of the middle meatus to the sphenoid ethmoidal recess, and into the ostium of the sphenoid when this is seen. These pledgets are allowed to remain for two hours and are removed by the patient himself. This is done twice daily, morning and afternoon. Frequently the result of this method of treatment is astonishing. It has often cleared up the symptoms, although in some cases relapses have followed, which required surgical intervention. The author reports one patient who showed prompt clearing up of symptoms, following the prolonged anemia, but who had a relapse which led later to surgical treatment. He recommends the use of Daueranämie in all cases as it is a clear point in the differentiation between the retrobulbar optic neuritis of nasal origin and that due to multiple sclerosis. In addition, he advises a complete examination of the cerebral spinal fluid, as the differential diagnosis frequently can be made thereby.

The results obtained by the author are as follows: Of the 16 patients in the first group, 4 of whom showed disease of the nasal sinus, 9 recovered completely, 4 recovered partially and 3 did not show any improvement. Of the 13 positive cases in the second group, 10 recovered completely, 1 partially and 2 did not show any improvement.

The Relationship of Sinusitis and Bronchiectasis. In this study by L. H. Quinn and O. O. Meyer[4] 22 or 38

(4) Arch. Otolaryng., August, 1929.

patients with bronchiectasis (57.9 per cent) were found to have coexistent sinusitis. As a class, the patients with sinusitis were considerably younger than those without. The majority of these patients had no symptoms of sinusitis. From this series, no relationship between the degree of sinusitis and the degree of bronchiectasis could be established. Aspiration of iodized oil into the lung from the nasal fossae while one is asleep is possible and does occur with apparent ease, and not infrequently the quantity aspirated is surprisingly large. Aspiration of an oily fluid from the nose is so easy that it seems logical to assume that aspiration of infective material, as pus, might also be simple. In view of this circumstance, it is felt that aspiration is probably the most important explanatory factor for the frequent concomitance of bronchiectasis and sinusitis.

Filling of the bronchi by the intranasal route with the patient sleeping might be offered as a method when difficulty is found in filling by the usual methods or when bronchoscopy is undesirable.

[It is easy to understand that an acute infection of the respiratory tract may produce simultaneously sinusitis and a bronchial disease. It hardly seems logical to assume that the sinusitis is necessarily an etiological factor in the bronchial trouble, since both owe their origin to the same infection. Those who claim that an all but latent sinusitis is responsible for the development of bronchiectasis can hardly base their conclusion upon the inhalation of secretions, since such secretions are practically absent from the sinus.—Ed.]

Diseases of the Mouth

Primary Generalized Hypertrophy of the Gums. D. Perkoff[5] believes the entity of this condition is difficult

(5) Lancet, June 22, 1929.

to establish. Many authors believe the condition is congenital. Cases have been noted which were associated with mental deficiency, and some with overgrowth and irregularity in the growth and distribution of the hair.

The author's patient was a French polisher, aged 20, who came in complaining of foul breath and bad taste in the mouth. He was the sixth member of a family of eleven children, all of whom were in good health. The patient had never had baby teeth, in fact the second teeth developed only at the age of nineteen. His skin was coarse and his body hair was long, thick and black. His general health was good and his mentality normal.

The patient showed huge hypertrophied upper and lower lips. His mouth was so prognathous that his lips could not be strained over the hypertrophied gum masses. The gum tissue gave an appearance like the mouth of a hippopotamus or a rhinoceros, only on a small scale.

Upper Jaw—The hypertrophied masses consisted of two ill-defined masses, one extending from the posterior right extremity of the jaw to the region of the left canine or premolar, where there was a dip in the tissue extending from the palata to the buccal side; the other from the second premolar to the left posterior extremity. This latter mass extended across the mid-line of the palate, meeting its fellow of the other side. The proximity of the two masses gave the impression of a cleft palate, the cleft posteriorly admitting only the thickness of a visiting-card, and anteriorly widening out into a diamond-shaped impression 1.5 cm. in its greatest diameter. The mass in the anterior region was 2.4 cm. thick bucco-palatally, the mass in the right posterior region 3 cm. thick, and that in the left posterior region 3.3 cm. The depth of the mass anteriorly from the under-surface of the gum to the reflection of the buccal mucous membrane was 2.5 cm.

The only teeth present were the upper right first and

second premolars and molars, and the left canine; only the tips of the cusps were showing, looking like an ivory island in a sea of pink flesh.

Lower Jaw.—This consisted of three ill-defined masses extending (1) from the right third molar to the right second premolar; (2) from the first right premolar to the left first premolar, where there was a dip extending to about the first molar; and (3) embracing the first to the third molars. The left mass in the anterior region was 1.9 cm. thick bucco-lingually, the left 2.2 cm. The right posterior mass was 1.9 cm. thick bucco-lingually, the left posterior mass 1.9 cm. bucco-lingually. The teeth present were the right second premolar, first right molar, left first molar and second molar. The teeth protruded to a depth of 1.3 mm. The buccal mucous membrane was raised in ridges, which partially covered the hypertrophied masses of gum tissue.

Resection of a portion of the gum tissue on the right half of the upper and lower jaws was done. Microscopical report showed apparently chronic infective hypertrophied tissue, resembling fibroma. The Wassermann reaction was negative. *X*-rays of the teeth showed no evidence of milk teeth. In conclusion the author suggests that tentatively he believes the condition may develop on an endocrine basis.

Congenital Polyp of Soft Palate (Epignathus). In this case reported by E. Santi[6] a congenital hairy polyp of the soft palate was removed from an infant following attacks of violent coughing, suffocation and vomiting. Microscopic examination of the growth revealed a covering of normal skin and numerous well developed sebaceous glands. The central portion, which consisted principally of lobules of fat, also contained a longitudinal lamina of fibrous cartilage. Along the lamina were normal salivary glands of mixed type. As a simple form of teratoma, this polyp can be classified, according to the author, with the epignathi, forms which possess a mor-

(6) Arch. ital. di chiro., February, 1929.

phologic and embryologic continuity. They are derived from germinative material that, by some unknown process, becomes independent of the rest of the embryo and proliferates on its own account. The form of the epignathus is determined by the amount of material thus misplaced, its potential capacity, and the period of development in which the separation took place.

A Biochemical View of "Acid Mouth." An Editorial[7] refers to the statement of Le Chatelier, that if a system in equilibrium is shifted, a reaction takes place which opposes that constraint; that is, one by which its effect tends to be annulled. Many examples may be found in physical and sociologic phenomena to support the fundamental observations enunciated by Newton and later by Le Chatelier. Nowhere is it better illustrated than in biochemistry; but nowhere is scientific thought and even honesty more disregarded than in the pseudobiochemical propaganda inseparably connected with the exploitation of dentifrices and mouth washes. Consider, for example, what advertising writers are pleased to term "acid mouth." It is well known but not often admitted in the propaganda of certain dentifrice manufacturers that the *p*H level of the saliva is maintained regardless of the material introduced into it. In 1920, Bloomfield and Huck gave human subjects as much as 20 gm. of sodium bicarbonate a day without effecting any change in the *p*H value. Extending the range of experiments, Carlson and McKinstry of Oregon a few years later found among other results that acid or acid substances introduced into the mouth caused a marked increase in the *p*H value, which lasted about ten minutes and then returned to the normal *p*H value. Alkali or alkaline substances caused a marked diminution in *p*H or increased alkalinity, which lasted for a few minutes and then returned to normal. From these and other results, Carlson and McKinstry rightfully concluded that mouth acidity or alkalinity cannot be controlled by

(7) J. A. M. A., March 16, 1929.

any induced substances, regardless of its original strength or *p*H value; i. e., the tendency is for the *p*H value of saliva to return to the normal level of the individual. Here, too, as in other natural phenomena, is Le Chatelier's principle verified that a system in equilibrium which is disturbed tends to return to its original state. Other workers too have found similar relationships. Clark and Levine found that the chlorin content of resting saliva is not increased by ingestion of chlorides. Clark and Carter describe the tendency of the saliva to return to its normal state in the following words: "Accepting an average *p*H of 6.6 (for normal saliva) it is evident that saliva is a well buffered mixture and would be able to neutralize large amounts of hydrogen or hydroxyl ions without showing appreciable change in the *p*H value."

That the saliva is not a thing apart from other biologic phenomena is illustrated in other directions. Recently Chambers and his co-workers of Cornell University found in a series of micro-injection studies on lower forms of life that, as long as the injected cell remains alive, the *p*H of any solution injected quickly changes to that of the protoplasm of any cell.

The main agreement between workers in what appears at first sight to be wholly unrelated systems is not without some significance for the claims made for the many dentifrices and mouth washes now on the market. Dentifrices of both acid or alkaline nature are sold with the claims that they will correct all sorts of supposed conditions in the mouth. Many of the alkaline dentifrices, presumably designed to correct mouth acidity (which in a sense is the normal condition), are especially blatant in their announcements. If an abnormal acid or alkaline condition is present in the mouth, there is probably an underlying constitutional cause which should have the expert attention of physician and dentist. Sooner or later, manufacturers of dentifrices will have to heed the results of scientific

investigation. The chief purpose of a dentifrice is to clean the teeth or, more practically, to establish a healthy habit. The balance of evidence is against the view that dentifrices can be used for so-called mouth correction.

New Researches on Alveolodental Pyorrhea. The correspondent states that R. Vincent[8] has recently given a rather new explanation of alveolodental pyorrhea, and the therapeutic results to which it has given rise seem to justify a certain measure of recognition. He states that, in the gums, particularly in the region of the interdental "bridges," there is a kind of lymphoid tissue similar to that of the tonsils and the appendix. This tissue, he explains, serves as a sort of excretory organ of micro-organisms. The micro-organisms thus eliminated come from distant foci of infection, often located in the intestine. Having been carried to the region of the gums, they set up an inflammation, and this causes the localized necrosis of the maxillary bone and the fetid suppurations that are characteristic of pyorrhea. As a practical deduction of this mode of thinking, the author recommends ascertaining, in the blood taken from the region of the gums, what micro-organism is responsible for the disturbance and the preparation therefrom of an autovaccine. The use of such vaccine effects an arrest of the evolution of the pyorrhea and checks the primary causal infection.

Leptothrix of the Oral Cavity. Leptothrix appears in the oral cavity most frequently as leptothrix buccalis. It is found as sordes on the teeth, especially in carious teeth. It is aggressive and is concomitant with formation of tartar and decalcification of the teeth. Leyden and Jaffe, and Lenhartz have found it occasionally in deeper processes, for instance, in tonsillar abscesses and in gangrene of the lung. Yet leptothrix could not be established as the causative factor of these diseases, contrary to the views of others. It is said to be found in

(8) J. A. M. A., July 6, 1929.

the vagina, as a harmless parasite. E. Brack[9] reports two cases.

Case 1.—A man, aged 31, had noticed a small tumor in the throat for several months. It was of the size of a lentil and was attached to the right anterior palatine arch, with a broad base, extending to the surface of the tongue. It had the appearance of a fibro-epithelioma. Under cocain anesthesia, the tumor was removed. In two weeks, the wound had healed without a scar.

Case 2 (former case of Roedelius and Brack). — A woman, aged 70, had for a long time noticed a swelling on the left margin of the tongue rather far back, which was painful and had increased rapidly in size. A surgeon thought that the swelling was a circumscribed phlegmon of the tongue or an abscess, and incised it. A part of it was excised and sent to the author for examination. Culture revealed mainly diplococci in chain formation, besides some bacilli. The wound healed promptly. Just as in the first case, the histologic examination revealed leptothrix.

The process consists, first, of an irritation of the epithelium, leading to fibro-epithelioma; then a deep necrotizing process sets in. The epithelium remains intact, however, for a surprisingly long period. Contrary to the tendency of the streptotrichal organisms, especially actinomyces, leptothrix does not seem to enter the blood current from the lung and is not hereby carried to the brain or to the other organs.

Ludwig's Angina. A. P. Ashhurst[**] considers Ludwig's angina as a clinical entity—a septic cellulitis of the floor of the mouth and the neck. The disease was originally described in 1836 by Ludwig who reported five cases, three of which were fatal. Ludwig defined the condition as an inflammation of the cellular tissues which begins around the submaxillary gland, invades the neck and floor of the mouth, and terminates in death in ten

(9) Ztschr. f. Hals-, Nasen-u. Ohrenh., September 5, 1928.
(**) Arch. Surg., XVIII, 1929.

or twelve days or gradual recovery. He summarized its characteristics as an insignificant inflammation of the throat which soon subsides, a peculiar wooden hardness of the cellular tissues, a hard swelling under the tongue, a callous swelling on the inner border of the mandible, a well-defined border of hard edema in the neck, and absence of disease of the glands in spite of the involvement of the surrounding tissues.

The author describes the condition as an acute inflammatory process involving the cellular tissues of the floor of the mouth and the submaxillary region of one or both sides of the neck—a true cellulitis to be distinguished from lymphangitis and lymphadenitis. He states that the lymph nodes and submaxillary and sublingual salivary glands may be involved secondarily. The cellulitis may begin in either the sublingual or the submaxillary cervical tissues.

Lymphangitis and lymphadenitis always arise from surface lesions in the skin or mucous membrane, whereas cellulitis is due to infection arising in the cellular tissues themselves and spreading by direct continuity instead of by way of the lymphatics.

The author reports 18 cases of true Ludwig's angina. In eleven, the condition was due to tooth infection; in one, to an infection of the tongue; and in six, to an unknown cause. Thirteen of the patients recovered and five died.

The author describes the routes by which pus may escape from an infected tooth and infection may spread in the neck by fascial plane extension. The communication between the sublingual and submaxillary regions at the posterior portion of the mylohyoid and the relationship of the carotid sheath are described on the basis of dissections and injections of dye.

Following the diagnosis of Ludwig's angina, a small submental midline incision should be made and through-and-through drainage established by means of a rubber tube through the floor of the mouth behind the sym-

physis. A second incision 4 or 5 cm. long should be made anteroposteriorly, well below the angle of the jaw but through only the skin and platysma. The submaxillary space should then be traversed by blunt forceps, the floor of the mouth perforated, and rubber tube drainage established through this opening. Hot moist dressings and frequent irrigations are indicated.

Salivary Calculi and Their Treatment. Calculi in the salivary glands are most frequently found between the ages of 20 and 40. Men are affected to a greater extent than women in the proportion of three to one. The size of the calculi varies greatly; C. P. Wakeley† notes that they may be as small as grains of sand or as large as a bantam's egg. More commonly they vary from the size of a split pea to that of a date-stone. They are usually single and in a small percentage of cases only does recurrence take place after removal. As a rule, calculi in the glandular tissue are spherical or oval, while those in the ducts are elongated and resemble date-stones. In the ducts they may be multiple and are then usually arranged end to end, the opposed surfaces being faceted. The surface of the calculus may be finely or coarsely granular and is usually of a dirty yellowish-gray color. The structure varies considerably. In a fair proportion of cases a foreign body has been found as a nucleus. Some calculi are laminated, but this is rare. By far the majority of stones from the salivary glands and ducts are composed of calcium phosphate and calcium carbonate.

The cause of calculus formation in the salivary glands and ducts has been, and still is, the subject of much discussion. That some constitutional condition may predispose to calculus formation seems very improbable. If a general cause was in any way responsible one would expect it to exert its influence upon more than one gland, and to give rise to calculi in several glands or ducts. As a result of carefully examining the very ex-

(†) Lancet, April 6, 1929.

tensive literature on the subject the author has been able to discover three cases only in which calculi have been found in more than one gland or duct in the same person. When foreign bodies form the nucleus no doubt they are the initial cause in the formation. Foreign bodies, however, must not be regarded as the sole cause, nor must it be thought that any foreign body introduced into a salivary gland or its duct will of necessity cause the formation of a calculus. The literature abounds with cases in which a foreign body such as a piece of straw, grass, or hair has been lodged in the salivary ducts for long periods of time without giving rise to any calculus formation.

An analysis of the recorded cases of salivary calculi published up to the present time brings out the following figures:—

Submaxillary gland and duct.....63.2 per cent
Parotid gland and duct.....20.6 per cent
Sublingual gland and ducts.....16.2 per cent

It is necessary, therefore, to explain the far greater frequency of calculi in the submaxillary gland and Wharton's duct than in the other salivary glands and their ducts. It must be conceded that, owing to the greater size of the duct and the position of its orifice, foreign bodies such as tartar and particles of food can enter Wharton's duct more easily than they can the ducts of the other salivary glands. The composition of tartar is very similar to that of calculi. Therefore, although tartar may quite often be a determining factor, it would be quite impossible to demonstrate it. Similarly, food particles may enter the duct, undergo decomposition there, and simply add to the percentage of organic matter in the calculus without other evidence of their presence.

If a salivary calculus is carefully cut through its centre and a culture is made from the interior, bacteria are nearly always found. It might be thought that bacteria were the actual cause of the calculus, but this

certainly cannot be the case, since, if infection alone were the important factor, calculi would occur more frequently in the gland and duct which are most often the seat of infection—namely, the parotid and its duct. Bacteria probably do play a part in the formation of calculi by decomposing the proteids in the saliva. It is a well-known fact that if saliva is exposed to the air for a short period of time carbon dioxid escapes from it and a thin film of calcium carbonate soon forms on the surface. Therefore the removal of carbon dioxid alone is sufficient to precipitate the calcium salts. When bacteria decompose the proteids in saliva ammonia is produced, and probably immediately unites with the carbon dioxid held in solution; thus a condition favorable for calculus formation occurs. If this be so, it is quite reasonable to conclude that bacteria cause, indirectly, a precipitation of the calcium salts of the saliva by increasing the alkalinity of the saliva and removing carbon dioxid.

The composition of the saliva from the submaxillary gland allows easier precipitation of calcium salts than does that of the parotid or sublingual. The factors which predispose to a precipitation of the calcium salts in the submaxillary gland are: (1) high percentage of solids, (2) high percentage of organic matter, (3) greater degree of alkalinity, (4) low content of carbon dioxid.

Calculi are very rare in the parotid gland itself, Stenson's duct being much more frequently the seat of the formation. Multiple calculi are more common than single. Abscess formation around long-standing calculi is quite a common complication, and should the abscess open externally a fistula results. The masseteric portion of Stenson's duct is the most frequent situation for calculi, and their removal necessitates an external incision. Fistulae may follow, but are rare if the incision is longitudinal and closed by stitches after the removal of the stones. If calculi be present in the premasseteric por-

tion of the duct they may be liberated by an incision through the buccal mucous membrane.

Calculi found in the submaxillary gland or its duct are usually single. The single calculus may be seen in a variety of shapes according to the position in which it is lodged, either in the gland or in the duct. If it is in the gland it is usually rounded in appearance, while if it is partly in the gland and partly in the duct it assumes a tapering form, the "comma calculus," the larger part of the calculus being in the gland while the smaller portion extends into the duct. This type is quite common, and the thinned distal portion is liable to be fractured and may then pass along the duct into the mouth, while the larger proximal portion remains in the gland. Such a calculus in the submaxillary gland cannot be palpated owing to the amount of fibrous tissue surrounding it, but it can nearly always be demonstrated by *x*-rays. If, however, the calculus is in Wharton's duct it is usually molded by the muscular wall and may be said to form a cast of the duct. Lastly, if a calculus is formed at the orifice of Wharton's duct, or a small one passes along the duct and becomes impacted there, it is nearly always cylindrical.

The treatment of submaxillary calculi is quite simple. Calculi in the gland usually necessitate excision of the gland, because there is always considerable fibrosis of the glandular alveoli due to the presence of the calculus and the back pressure exerted thereby. If the stone is in the duct an incision through the mucous membrane of the mouth into the duct is all that is required, and this can easily be performed under local anesthesia. Calculi may re-form in either the gland or duct after an operation on the duct itself; oral sepsis plays a very important part in such cases. Stricture formation may follow ulceration of the wall of the duct, the ulceration being due either to the calculus or to the incision made in the duct. Incisions within the mouth cavity must always, even in the best circumstances, become infected

owing to the innumerable bacteria which are invariably present.

One would expect that owing to their composition salivary calculi would be quite opaque to *x*-rays. This proves to be usually the case, as Harrison, reporting upon 27 cases of salivary calculi in which operation was performed, obtained positive *x*-ray findings in 81.4 per cent.

Calculus formation in the sublingual gland and its duct is a rarity, and very few cases are recorded. However, calculi are sometimes found in association with cystic distension of the gland.

Mouth Infections in Relation to Systemic Disease. In some of the acute contagious diseases stomatitis is part and parcel of the general clinical picture and is of considerable diagnostic importance. After all, according to J. H. Musser‡, in the acute contagions, diagnosis is of primary importance because the earlier the disease is recognized and appreciated the more efficacious will be the specific treatment available for the handling of several of these disorders.

Measles.—In measles there are found the small bluish-white spots surrounded by a red areola (Koplik's spots). The fact that Koplik's spots can be observed satisfactorily practically only in bright daylight is not generally appreciated, and explains why frequently they are not seen because the small hand light, very generally used to examine the mouth, does not give proper illumination.

Scarlet Fever.—The angina of scarlet fever is one of the important diagnostic criteria of the disease, but equally important, is examination of the tongue. The bright red tip and edges with a whitish coat on the dorsum presents a characteristic picture, and the disappearance of the white fur 24 to 48 hours afterward clinches the diagnosis. Therefore, of particular moment is the appearance of the papillae of the tongue, which are very distinctly enlarged, protruding very pronouncedly from the surface of the mucous membrane.

(‡) California & West. Med., September, 1929.

These may best be appreciated also with proper lighting. The tongue should be held slightly at an angle to the light so that a shadow is cast by these protruding papillae which intesifies and brings them out more markedly than when looked at with the light shining on them directly. The buccal mucous membrane also shows evidence of the angina. Sometimes when the throat can be poorly seen, as with a struggling child, the appearance of the rather red, glistening, almost edematous-appearing mucous membrane is a distinct diagnostic aid.

Diphtheria.—Diphtheria of the mouth is rare. In a very large series of patients that the author has had the opportunity of observing in the past few years only two cases have occurred, and in both of these the disease was far advanced when admitted to the ward, and extensive diphtheria involvement of the mouth and throat existed.

Varicella and Variola.—In varicella, ulcers occasionally appear in the buccal mucous membranes, but aside from their annoyance, being painful like all ulcers of the mouth, they are of no moment. In variola pustules may form in the mouth simultaneously with those of the skin and soon break down and become ulcers.

Vincent's Angina.—This mouth disorder often is an extremely severe one, so severe indeed that it may result in the death of the patient. Whether the Vincent's organisms and the associated spirilla are responsible for the systemic infection is an open question. It may be that the secondary infection that occurs is responsible for the occasional severe toxemia and death in some of the severely poisoned individuals. In the angina of Vincent the author has noted some rather remarkable blood findings, findings which would tend to confirm the supposition that a severe toxic reaction is not necessarily due to septic organisms. He has quite a series of cases in whom a leukopenia was present with relative and absolute decreased polymorphonuclears and with a relative and sometimes an absolute increase in small mononuclears.

Stomatitis exists with surprising frequency in the avitaminoses. In xerophthalmia, mouth lesions are said to be present. In beriberi, gingivitis frequently occurs and resembles somewhat that of scurvy. In scurvy the mouth picture is one of the characteristic features of the disease. The markedly swollen, discolored and painful gums, which bleed on slightest trauma, present a picture which is quite typical of the disease. Here also it might be well to note the fact that scurvy is associated with a tremendous tendency to hemorrhage, and exhibits many of the phenomena of the blood dyscrasias.

The three diseases—pellagra, pernicious anemia, and sprue—may or may not be considered by some as deficiency disorders, but the general consensus of opinion seems to be that pellagra at least, pernicious anemia probably, and sprue possibly may be due to the absence of some necessary accessory food factor. Absence of the pellagra-preventing factor in the diet is certainly responsible in many cases for pellagra, a condition in which one finds a quite typical beefy red tongue, which is painful and which may be accompanied by inflammation of the mucous membrane of the mouth elsewhere.

Sprue.—The tongue in sprue resembles somewhat that of pernicious anemia and pellagra. As with pernicious anemia the acute stages of sprue may be associated with a smooth, red and glistening tongue, a glossitis which at times may only involve the tip and edges or one side. Chronic recurring sprue is often associated with a tongue which has become badly cracked and fissured.

In the deficiency diseases enumerated, with the possible exception of beriberi, blood changes are a rather remarkably consistent feature.

Anemia.—In anemia a true stomatitis is exceptional, but does occur occasionally, as with any condition which produces a systemic lack of resistance to an infection of any kind. Incidentally, it should not be forgotten that a very potent cause of severe secondary anemias is oral

sepsis, so that one may be responsible for the other, or vice versa.

Hemophilia.—In hemophilia the most outstanding feature in regard to the mouth is the frequency with which there is capillary oozing from the gums. It does not, however, indicate that the condition is anything other than part of the general picture of the disease.

Chlorosis.—In this condition, now so rare, the gingival margin often has a bluish tinge, while caries of the teeth is very generally a rapid and disturbing process and there is a marked tendency to periodontal involvement.

Infectious Mononucleosis.—This throat lesion is interesting and the relation of the disease to the unusual in blood disorders is very obvious. The occurrence of sore throat, enlargement of the cervical and other lymph glands, associated with reduction of the number of granulocytes, with a relative and absolute increase in the mononuclear cells, make up the invariable findings of the condition.

Leukemia.—In acute leukemia ulcerative mouth lesions are almost invariably present. There is a marked increase of the young and immature white cells, whereas the normal adult granular cell, the polymorphonuclear leukocyte, is relatively diminished, occasionally absolutely decreased in number.

Agranulocytic Angina.—That this condition exists as a definite disease entity is doubted by many. However, it is fairly generally recognized as a true disorder of the bone marrow associated with necrotic and ulcerative pharyngeal lesions, occurring most frequently in middle-aged women, in whom there is an absence of septic foci, leukemia, or hemorrhagic diathesis. In the mouths of these individuals Vincent's organisms and spirochetes have been almost invariably present. The reduction in the number of circulating granular cells is most pronounced, so that total counts of under a thousand appear not to be unusual. That this condition bears somewhat direct relationship to disturbed hemopoietic pathology

cannot be doubted. Whether or not the necrotic inflammation of the mucous membrane is the cause of the hypogranulocytosis or the hypogranulocytosis is the cause of the necrotic ulcerative changes in the mucous membrane is not known.

Aplastic Anemia.—In aplastic anemia the mouth picture may or may not transcend the other clinical manifestations of the disease. True aplastic anemia is a relatively rare disease. It is also associated with ulcerative mouth lesions of several types.

Purpura Hemorrhagica.—Occasionally ulcerative anginas are seen in connection with this blood dyscrasia.

[The inability to exclude the tonsils as a possible focus of infection because of apparently negative findings should be recognized. Where there is a serious systemic infection, especially of a rheumatic character, and no other likely focus is discovered, the tonsils should always be under suspicion, as they constitute the most frequent source for the systemic trouble. Under these conditions tonsils, which otherwise should be left alone, might properly be removed.—Ed.]

Five Year End-Results of Radiation Treatment of Cancer of the Oral Cavity, Nasopharynx and Pharynx. This report by B. F. Schreiner[1] is based on a study of 309 cases. The cases were divided into two large groups: Group I included all cases, no matter how extensive locally, having no demonstrable metastases in the lymph bearing areas at the time of admission. Group II included small or large local lesions, with definite metastases at the time of admission. It was thought to be of interest to separate the lesions as to primary seat of origin as there seems to be a difference in the prognosis. Only those cases were included in this report in which the treatment primarily was by irradiation.

The author's experience shows that:

1. The end results of treatment of epithelioma of the

(1) Radiol. Rev. & Chicago M. Rec., August, 1929.

oral cavity with bare seeds is superior to surface applications.

2. Surface applications of radium in Group I cases of the oral cavity show a 5 year healing in 5 per cent of the 43 cases treated. In Group II there was no 5 year healing in the 53 cases treated.

3. The implantation with bare seeds in Group I cases of the oral cavity shows a 5 year healing in 17 per cent of the 69 cases treated. In Group II a 5 year healing of 2 per cent of the 123 cases treated.

4. Tobacco, dental caries and luetic infections are very prominent etiological factors in this series of cases.

5. The prognosis is better in cancer involving the inner cheek and upper gum than in the floor of the mouth and lower gum.

6. After careful study of this survey of the methods and end-results of this series of cases, and his experience with gold implants since 1926, the author has greater hopes for the future.

Electrodesiccation and Electrocoagulation in Neoplastic and Allied Diseases of the Oral Cavity and Adjacent Parts. According to W. L. Clark[2] there is an impression among many of the profession that the desiccation and coagulation methods are one and the same. This is an error, since the effects produced on the tissues are quite different and can be readily demonstrated, both clinically and histologically. The Oudin current, by which desiccation is produced, is of relatively high voltage and low amperage, whereas the d'Arsonval current, by which coagulation is produced, is of lower voltage and higher amperage.

A milliampere meter cannot be used to measure accurately a monopolar current. The proper current strength necessary to destroy growths of different types and sizes within the mouth or elsewhere can be learned only by experience. The desiccation effect may be produced in the tissues by delivering the current through a

(2) Am. J. Surg., March, 1929.

short air space, by just touching the surface or by inserting a needle more or less deeply, according to the degree of destruction desired.

The desiccation method is used advantageously when the lesion is comparatively superficial and localized, and when it is desired to avoid a contracted cicatrix. It is subject to such perfect control that an exceedingly small growth, even on the cornea of the eye, can be successfully treated without impairment of vision by the subsequent formation of scar tissue. A small growth on the vocal cords may likewise be destroyed without impairing the voice. It will thus be seen that this method can be employed advantageously in the treatment of such lesions in the mouth as leukoplakia, papilloma, angioma, Vincent's or other localized infections, lupus vulgaris, infected tonsils, exostoses, epulis, sarcoma, localized epithelioma, etc. The comparatively slight trauma to the tissues and the mild secondary inflammation explain, from a histologic standpoint, the slight scarring and the success obtained in treating delicate structures.

The Coagulation Method.—Coagulation is produced by a bipolar high frequency current of the d'Arsonval type, a multiple spark gap being employed. It is more penetrating and intense than the desiccation method, and in accessible locations is utilized to destroy larger growths, even those involving bone.

Twenty years of intensive study and experience have demonstrated to the author that malignant disease within the mouth and adjacent parts, while always a most serious affection, is not necessarily hopeless, since many brilliant results are obtained by the judicious employment of combined methods, of which electrodesiccation and electrocoagulation are most important, indeed, are, on pure merit, entitled to hold first place in treatment of primary lesions.

Operative surgery is also considered indispensable, and is constantly employed by the author to ligate blood vessels and to resect bone. In certain instances cervical

lymph nodes are surgically resected, but never before the malignant element has been inhibited, or, when possible, entirely destroyed by pre-operative irradiation treatment. A gastrostomy is often performed to insure proper feeding in undernourished patients, owing to difficulty in deglutition before the operation and during the convalescent period. Many radical electrothermic operations have been rendered possible by this preliminary gastrostomy.

Radium and roentgen rays are used in the writer's practice in connection with neoplasms in the locations under consideration principally to control metastasis to the cervical lymph nodes, and their value for this purpose has been definitely established.

The primary lesions are, with certain exceptions (cases in which vital structures or those very important to conserve are involved), best treated by the electrothermic methods, and the author has had no cause to regret this practice after critical comparison of results of different methods in many cases.

The histology of malignant lesions within the mouth and elsewhere is often a determining factor in prognosis, and also a guide to treatment, since embryonic, fully differentiated and intermediate cells require different treatment, especially in relation to irradiation; for example, squamous cell epithelioma, grade 4, which cells are undifferentiated, though most malignant, respond more readily to the roentgen ray and radium treatment than grades 3, 2, or 1, which are in different stages of differentiation. This is explained by the slight resistance to these treatments by the embryonic cells and the greater resistance as the cells approach the adult grade. Many pathologists do not yet appreciate the significance of this differentiation, nor do they recognize the different grades under the microscope. A check of many cases in which histologic studies have been made during the past twenty years has demonstrated beyond a doubt that it is important to know definitely the grade of the tumor

and that there are certain characteristics of staining that positively identify the grades. The article is accompanied by numerous illustrations.

Cancer of the Tongue and Floor of the Mouth. An analysis of 164 cases is presented by G. M. Dorrance and J. K. McShane[3]. In their service at the Philadelphia General Hospital, they have had excellent opportunities to see the results of other clinics and have come to the conclusion that no one method is the ideal way to treat cancer of the tongue and floor of the mouth. The good results have of course not come to them but the bad results have had every form of treatment possible before coming. Some had surgery alone, local excision and removal of the glands of the neck. Others had electrothermic coagulation of their lesions and some had *x*-ray or radium treatment of their necks while others have not. Still another class has been treated with radium alone, although this has usually been inadequate from the standpoint of sufficient dosage.

The authors feel that the treatment of cancer of the tongue and floor of the mouth must be modified to the type of patient, and they advocate in those cases that are good risks and whose disease has not spread so that they are in the hopeless class radium packs to the neck, gold tube implantation into the lesion in sufficient dosage to either entirely destroy the lesion or to cause a sharp radium reaction. At the end of 10 to 14 days electrocoagulation of the lesion is done with possibly a preceding bilateral ligation of the external carotid, depending upon the extent of the lesion. The neck radiation at a distance of 6 cm. is continued on both sides until an arythema dose of 10—15000 millicure hours has been given. It is best to give this in five divided doses at two day intervals. Six weeks rest is then indicated and the patient is observed and further treatment carried out if indicated.

The writers have discontinued all block dissections of

(3) Ann. Surg., December, 1928.

the neck and radical excisions, as they feel that more can be accomplished with the radiation, and there is a 10 to 20 per cent mortality in this particular type of case when any radical surgery is attempted.

In patients who are a poor surgical risk and yet have an early or only moderately advanced cancer, they carry out the treatment advocated above except that they do not always coagulate the lesions. Sometimes in these patients after the gold tubes have been inserted, the lesions have so far regressed or have entirely disappeared so that coagulation is not indicated. Such has been the case in three patients.

In advanced cases, the authors either do not treat them at all, or else radiate the metastatic nodes vigorously and implant gold tubes into them and into the primary lesion. They have been unable to cure any patient with metastatic nodes in the neck, by irradiation. They caused them to shrink down and have held them in check for a time, but sooner or later, these patients died of their cancer.

In this series there were nine patients in whom the cancer has been arrested, and who show no evidence of their disease at present. Four patients are alive over four years. One patient died after four years. He had a very thorough autopsy. He died of a retropharyngeal abscess. No cancer could be found. Two patients are alive over four years and the remaining patients—one, two years and four months and the other, one year and eight months.

Of the 164 cases, 20 (12 per cent) were admitted in a dying condition and lived from one day to three weeks. Another group of 85 (51 per cent) presented marked cachexia, extensive primary involvement and widespread neck metastasis when they first came under care. They received moderate mild radiation as palliative treatment and died in from one to six months. There were 27 (16.4 per cent) patients who lived from six months to one year. In the group that lived from one

to one and one-half years, there were 7 (4 per cent). All of these except one died, this one being at least temporarily controlled.

Three patients lived between one and one-half and two years and are still alive. Two patients lived over two years but finally died of their cancers in spite of very active radiation. Two other cases lived over three years, while in a final case life was prolonged for over five years by irradiation. Autopsies were performed in fifteen cases and in none of these were metastases found beyond the neck.

Diseases of The Throat

The Tonsils

Recognizing Tonsil Infection. It is the belief of F. M. Meixner[5] that an accurate diagnosis of tonsillar disease must be made before operation, to obviate needless operations and determine the benefit the patient may expect to receive. Except in purely local tonsillar disease the diagnosis and interpretation of indications for operation cannot be made solely by the nose and throat man, but must be done by the internist. To the internist, pediatrist, or the family physician should fall the responsibility of coordinating the facts, dictating the operations and outlining the future treatment.

As many tonsils are needlessly removed, subjecting the patient to the risks of operation and without benefit, as are left in by inaccurate diagnosis of the tonsillar disease. It is not always possible to determine the relation between systemic disease and a tonsillar condition, but careful examination of the tonsil, and a complete history of the patient's symptoms may be big aids in establishing the etiology and indicating the treatment.

In children the appearance of the tonsil should not be the determining factor, but the history of infections

(5) Illinois M. J., June, 1929.

and symptoms must determine when tonsils should be removed. Closer cooperation should exist between the nose and throat specialist and the internist in studying tonsillar disease, and the benefits to be derived by tonsillectomy. Removal of tonsils will not repair the damage done in other organs, and complete cure of the symptoms based on a tonsillar infection cannot be prognosticated, neither can the bad results and incomplete cures be used as an argument against tonsillectomy, an operation which will prevent further damage, but cannot repair that already done.

Removal of the tonsil does not cure the patient. He should return to the physician for reconstructive treatment, further observation and continued advice, constantly bearing in mind that there may be further foci present that prevent complete recovery.

[The author does well to emphasize care in diagnosing conditions of the tonsils which justify operative procedure, and emphasize the desirability of the nose and throat specialist cooperating with the internist in all cases where the chief indication is some suspected systemic disease of focal origin. The time has come when a wave of conservatism regarding tonsil operations is due. The tendency for general surgeons, pediatricians, and general practitioners to undertake operations in a special field like otolaryngology, is to be deprecated. The specialist is right in assuming responsibility for undertaking the removal of tonsils only where the local indications justify. Cases do arise frequently where local indications themselves hardly justify operation but where the indication for removal is some systemic infection. In these cases, the internist is the one who should decide.—Ed.]

Relation of Tonsils to Acute Rheumatism During Childhood. The analysis made by A. D. Kaiser[6] of 439 rheumatic children disclosed the following facts: The most susceptible age for the first attack of rheumatism

(6) Am. J. Dis. Child., March, 1929.

is between 8 and 14 years. In nearly twice as many children in the community studied the first attack of rheumatism developed when the tonsils were still present. Recurrent attacks of rheumatism occurred 10 per cent less often in children who had their tonsils removed after the first attack of rheumatism than in those whose tonsils were not removed. The incidence of carditis as a complication in acute rheumatism was nearly as frequent in children who had undergone a tonsillectomy as in those who had not. Chorea occurred as a complication in acute rheumatism with equal frequency in children operated and not operated on, but the association of carditis with chorea was less in children whose tonsils had been removed. Tonsils are the avenue of infection in many cases of rheumatism and bear a definite relationship to this disease. Their removal should be advocated in the rheumatic and potentially rheumatic child until more is known of the etiology of rheumatism.

[Our observations lead us to believe that an acute attack of tonsillitis most frequently is responsible for rheumatism and endocarditis in children, and that recurrence of the systemic infection is much less likely to occur after removal of the tonsils, but may occur in such cases from an acute pharyngitis. This is not an argument, however, against removal of the tonsils.—Ed.]

A Further Study of the Relation Between Thyrotoxicosis and Tonsillar Infection. L. E. Brown[7] states, according to much accumulated evidence, that it is reasonable to say today it is a known fact that this relationship does exist and that tonsils are a definite causal factor in many cases of toxic goiter.

Having observed a greater number of cases and over a longer period of time, the writer is quite convinced that this syndrome is assuming the rôle of a distinct entity and claims the attention of and closer cooperation between physician or surgeon and the laryngologist.

It has been the author's experience to see many of

(7) Laryngoscope, September, 1929.

these patients and call to their attention the fact that they were developing a goiter, which, after a careful history, examination, metabolism test and observation, proved to be of the toxic type, and greatly influenced by an attack of tonsillitis or peritonsillar abscess. Some of these cases have received a great deal of benefit and shown marked improvement following a tonsillectomy and the administration of iodin in some form, preferably Lugol's solution. Most of them, however, had progressed to such a point that thyroidectomy was necessary, and in these cases it was found necessary to do a tonsillectomy either as a preliminary operation or as soon after as consistent, in order to obtain complete relief from all the disturbing symptoms occurring in these cases.

After all these years it is still not possible to state definitely what the *modus operandi* is in the transmission of the toxins from the infected tonsils to the thyroid gland, nor has it been possible to prove by culture or chemical tests that this is a fact. So far we have been compelled to rely on history, observation and clinical findings, but it is the writer's hope that by further study of this subject we will arrive at some definite conclusion in reference to this point.

Having recognized that there is a division in the type of enlargement of the thyroid gland, known as toxic goiter, what are the most probable sources of foci from which the toxin may be derived that will produce this hypertrophy? May it not be the infected tonsils? It might also be well to consider the sinuses and teeth when making this survey. However, up to the present time the author has not seen a case which he could attribute to either of the last-named sources. A further study of this source of infection is necessary.

Some theories which the author would like to advance regarding the changes that take place within the gland and certain factors which may act as a probable cause of this condition are as follows:

1. May it not be possible that in a certain number of

cases due to the deficiency of the iodin content in the thyroid that its resistance to certain types of infection which may have a definite affinity for the thyroid, the toxin of which is generated in the tonsils, might explain this syndrome?

2. Is it possible that the infection which migrates to the thyroid gland may have a selectivity for certain structures of the thyroid and thereby inhibit their action in the production of thyroxin and thus bring about the change that occurs in the parenchyma of the gland, for it is a well known fact that these changes do occur where there is some interference with the iodin content of the gland?

3. What is the status of the lymphatic system in patients suffering from a toxic goiter? This should be taken into consideration and studied. The surface has only been scratched in the study of this most important phase of the subject.

4. What percentage of goiters are developing among the people, particularly girls nearing the adolescent age, where the tonsils and adenoids have been removed, compared to those who have not had the operation done? This is an interesting point and observations over a period of 5 to 10 years—particularly among the girls—would furnish some interesting and illuminating data on this subject.

5. Is it not possible that some individuals have certain areas that are congenitally less resistant than is normal, and that such areas are the ones to show evidence of disease, such as has been described above, namely, toxic goiter?

6. A very interesting experiment that might be carried out in a goiter area would be to take a group of patients with a beginning goiter, remove their tonsils and feed them on a well balanced diet consisting of vegetables and fruits produced on soil which had received special attention regarding the iodin content of same by having this garden sprayed regularly with water spe-

cially prepared with iodin, and note the results over a period of months or years.

Predominating Organisms Found in Cultures From Tonsils and Adenoids. From observations following 100 operations L. M. Polvogt and S. J. Crowe[8] note that the hemolytic streptococcus was the predominating organism grown in 91 per cent and the staphylococcus in 8 per cent. In one case no growth was obtained. There is no apparent connection between the predominating type of organism found in the tonsils and the clinical symptoms.

The majority of these cultures were made during the winter months, and all were made between November, 1927, and April, 1928. More than 50 per cent of the patients from whose tonsils a hemolytic streptococcus was grown in pure culture were children under 11 years of age. The majority of those in whom a staphylococcus was the predominating organism were over 25. The average time between the last acute attack of tonsillitis and the tonsillectomy was one month.

In 81 cases the hemolytic streptococcus was the predominating organism in both the tonsils and the adenoids. In 8 there was a heavy growth of staphylococcus from both the tonsils and the adenoids. In 10 there was a heavy growth of staphylococcus from the adenoid culture and a pure culture of streptococcus from the tonsils. A culture made by swabbing the surface of the tonsil is a reliable index of the predominating organism in the crypts.

[An interesting new method for studying the tonsils. It would seem that where the needle eye draws substances from the crypt micro-organisms should certainly be found; but where the needle eye fails to enter a crypt in the depth of the tonsil, no micro-organism is likely to be grown. A negative finding would therefore be of very little value, since there does not seem to be any clear way of determining whether the needle is in

(8) J. A. M. A., March 23, 1929.

the tissue of the tonsil or in the crypt.—Ed.]

Tonsil Puncture: A New Method of Investigation. J. Ramsay and C. M. Pearce[9] state that although much may be learned by an experienced observer from an inspection of the tonsils in situ, and from any history which bears on them, the standards of assessment as to their normality or otherwise have been somewhat arbitrary hitherto, and the personal factor must of necessity play a part in the examining physician or surgeon. They have tried to arrive at a more accurate estimate by means of direct puncture into the substance of the tonsil, with subsequent investigation of the aspirated material on lines which have been standardized. Of 158 tonsils examined by this method of puncture, from patients varying in age from 5 to 51 years, 17 were found to be sterile on culture. Streptococci were present in pure culture in 111 cases, and with other organisms in 26 cases. With fermentation tests, 81.2 per cent gave reactions for Streptococcus pyogenes and 18.8 per cent gave reactions for Streptococcus viridans or mucosus; 56.5 per cent of the streptococci were facultative anerobes, and 78 per cent gave a hemolytic reaction on hemoglobin agar. Diphtheroids were present in 4 cases; staphylococci in 18 cases (3 in pure culture); pneumococci in 5 cases (1 in pure culture), and B. influenzae in one case.

One patient who showed staphylococcal infection of the tonsil was suffering from sties and from a pustular eruption on the ear. Should the tonsil be found to be infected, the organisms can be tested against the patient's blood and some idea of the resisting power of the latter to the organism can be obtained. If the immunity of the blood is found to be impaired, removal of the tonsils is probably desirable, other things being equal. The uses and future possibilities of the method are discussed, particularly in relation to puerperal septicemia and to rheumatic carditis in children.

Pathologic Changes in Tonsils: A Study of Ten

(9) Brit. M. J., March 23, 1929.

Thousand Pairs of Tonsils. H. F. Wilkinson[1] reports that all tonsils show evidence of chronic infection, if the presence of leukocytes in the crypts and ulceration of the epithelium are an indication of infection. In 14.27 per cent of tonsils there are pathologic changes of bizarre types. In 11.21 per cent of tonsils there are cartilage and bone in various grades and proportions. Cartilage occurs in relatively larger amounts than bone.

Chronic infection is a great and definite factor in the production of fibrosis. Fibrosis is relatively increased in cases in which there is cartilage and bone. Chronic infection is an inciting factor in the production of cartilage and bone. Fibrosis increases independently of infection and in direct relationship to age. Bodies similar to those found in cases of actinomycosis occur second in order of frequency in pathologic conditions of bizarre type in the tonsil. Tuberculosis of the diffuse type has an incidence of 0.52 per cent, and is on the decline. In 0.17 per cent of tonsils there is bilateral involvement with tuberculosis. The percentage frequency of occurrence of cartilage and bone is increased in cases of diffuse tuberculosis of the tonsils. Cholesterol can be seen in 0.63 per cent of tonsils. Foreign-body giant cells and cholesterol are associated with each other in chronic degenerative processes of the tonsils. Trichinae are present in 0.06 per cent of extirpated tonsils.

In conclusion the author states that there is sufficient pathologic change of interest in the tonsils to warrant routine microscopic examination of removed tonsils.

Electrocoagulation of Tonsils. In this article G. A. Dillinger[2] answers the various critics of this method and again gives his technic. The author believes that electrocoagulation of tonsils is absolutely accurate, perfectly adequate and preeminently the most satisfactory method of removing tonsils. According to the writer, those who condemn his procedure either do so by blindly follow-

(1) Arch. Otolaryng. August, 1929.
(2) M. J. & Record, April 17, 1929.

ing the advice of others or, if they have tried it, have failed because of improper technic.

[The author expresses himself in rather strong terms. If the procedure is so difficult that others working with it fail to get satisfactory results, it is an argument against the procedure. We have seen patients where tonsils have been treated by this and similar methods and where the incidence of recurring infection in the tonsil fossa still persists.—Ed.]

Complications of Tonsillectomy in Childhood. A. G. Ogilvie[3] states that if the condition of a child within 24 hours of operation is not satisfactory it is evident first of all that this may be due to hemorrhage, surgical shock, or ketosis. Any one or more of these may be present, but even so, search should be made for evidence of other more important complications which may coexist at this stage. The temperature, pulse, and respiration may suggest pneumonia, and lead to an examination of the chest for evidence of this or of bronchitis, although a negative result cannot exclue either.

Pyrexia, without evidence of any of the above, suggests a close watch for evidence of scarlet fever or diphtheria, and an examination of the mouth for Koplik's spots, this last more especially in the presence of acute coryza. Even if these illnesses are incidental only, they are nevertheless important to detect. As a last resort, post-tonsillectomy intoxication may explain the symptoms, and is a relatively common condition. Such conditions as shock, ketosis, and post-tonsillectomy intoxication improve rapidly under treatment, and should such improvement not occur, it is an indication for a reexamination of the chest for signs of pulmonary involvement. Otitis media, nephritis, and septicemia are unlikely to provide evidence of their presence so early but an examination of the ears and the urine is wise; while a high temperature with a decided change for the worse suggests septicemia, and it is useful to remember in

(3) Lancet, April 27, 1929.

such a case that nephritis, pneumonia, and otitis media may all be secondary manifestations of this condition. The significance of cervical adenitis as a possible forerunner of acute nephritis may be helpful.

The next case for consideration is that of a child who has perhaps apparently recovered fairly well from the operation, but who is brought by his parents two to ten days after because he has been listless, irritable, and has refused his food, and has generally "not been doing well." The temperature will almost certainly be raised, perhaps to 99 or 100 F., perhaps higher. The operation wound may be dirty, probably with enlargement of the cervical glands, and this may be the explanation of the symptoms. Other complications, however, may occur at this stage, and these have to be excluded. Three investigations are here of first-rate importance—examination of the ears for acute otitis media; of the urine for blood, albumin, and casts; and of the chest for established pneumonia or early empyema. The possibility of septicemia is again to be considered, with aural, renal, and pulmonary complications as local manifestations, though usually the high swinging fever with the rapid development of an urgent illness suggests the diagnosis. A blood culture may settle the question. In otitis media watch should be kept, as always in this condition, for the development of a mastoid abscess.

Considering the evidence of the cases previously quoted, a prognosis given at any time during the period just considered may justifiably be favorable, except in septicemia where it must be guarded. This is assuming that no grave unforeseen development has occurred, when the prognosis must of necessity be modified.

Lastly, a child may be brought up for advice several weeks or even months after tonsillectomy with a history of ill-health dating from the operation. The most likely causes of such a history, assuming that we are satisfied of its connection with the operation, are a developing

bronchiectasis, perhaps with septic bronchopneumonia, an overlooked empyema, chronic aural infection with possible mastoid involvement, or post-tonsillectomy debility with or without some degree of secondary anemia. Subacute nephritis is rare, no cases occurring in the present series, but can be excluded by a routine examination of the urine.

A definite history of bronchitis following an operation with frequent recurrent attacks since suggests developing bronchiectasis, or at least an examination of the chest. Empyema, however, may give rise to no symptoms beyond debility and some shortness of breath on exertion, and therefore examination of the lungs must be routine in these cases in any event. The ears will yield definite positive or negative information, and the slightest mastoid tenderness is significant. These cases, however, are uncommon. The prognosis of empyema appears to be favorable, as previously stated, but bronchiectasis as always is of grave significance. The only case in this series died five months after operation. No case of chronic aural infection was noted, but cases do occur, and their course is apparently much the same as is usual in this condition—namely, tedious and uncertain. As has previously been mentioned, the series contains no case of post-diphtheritis paralysis. This is of interest, as it is still widely held to be one of the risks of the operation. That these cases occur is not questioned. It is, however, contended that the danger has been very greatly exaggerated.

It is hoped that this account of certain of the complications which may follow tonsillectomy will be helpful. The conclusion to which one must come on the evidence they supply is that not more than 1 in 200 cases of tonsillectomy suffers any ill-effects serious enough to confine the patient to bed as a result of the operation. Of these the majority are mild and readily overcome. The more serious complications are septicemia, nephritis, and pneumonia, and may be expected within a week

or ten days of operation, exceptions to this rule being bronchiectasis and empyema.

A Study of Post-Tonsillectomized Individuals. In this study A. J. Wagers[4] considers 274 original cases. However, of this group it was only possible to obtain follow-up records on 84. Therefore, the results of the investigation are really based on the latter number. After tonsillectomy no illness within one year or longer was reported by 37. Illness of some description was stated by 47. The operation definitely improved 63, while 21 claimed no improvement.

The Tonsil-Adenoid Operation and Some of its Results. The following report by J. H. Paton[5] is based upon the results of an analysis of the medical records of a group of girls in respect of the state of the tonsils, and deals with the relationship of this to various states of health and with questions arising in connection with the tonsil-adenoid operation. The records were obtained on the examination of 424 girls as they were admitted to a boarding-school for girls. The pupils are drawn from the professional and well-to-do classes of the community. The information is of value for comparison with data obtained from children of the same age in other strata of society. The ages of the girls ranged from 12 to 16.

It is assumed by those who advocate complete eradication that the functions of the tonsils are of little importance, but there are many reasons against such an assumption.

1. The tonsils have a free blood supply derived from three sources.
2. They have a double nerve supply.
3. They occur only in mammals.
4. In man they are specially active during childhood.
5. They contain many active germinal centres for the manufacture of lymphocytes.

(4) Laryngoscope, May, 1929.
(5) Quart. J. Med., October, 1928.

6. Their removal is followed by hypertrophy of neighboring lymphoid tissue.

The author's examination showed that 42 per cent of the girls admitted to the school had their tonsils and adenoids removed before the age of 14. The writer compared the operated and unoperated children as regards the following: bad teeth, postural defects, defective vision, enlarged cervical glands, flat foot, rheumatism, heart abnormality and bone deformity. From the resultant table the comparisons showed that those subjected to the operation were not only no better than the rest, but were actually worse in practically every particular with the exception of enlarged cervical glands. But it is also important to note that even among those whose tonsils and adenoids had been removed, enlargement of these glands was found in 11 per cent. The removal of adenoids results in an increased incidence of otorrhea, and that in several respects those in whom removal of tonsils was complete are worse off than those in whom it was incomplete.

While it is undoubted that in a considerable number of cases great benefit results from the tonsil-adenoid operation, in view of these facts it is evident that a more conservative method of dealing with many of the cases must be devised, and especially that attempts should be made to discover some method, other than surgical removal, of dealing with adenoid overgrowth in the nasopharynx.

[This article is rather refreshing because it is so much at variance with the usual arguments regarding tonsils. The arguments may be of value in deterring people from operating unnecessarily; but where a definite indication exists—such as, recurring attacks of acute tonsillitis, large infected tonsils with cervical adenitis—few will be influenced by hypothetical observations based upon anatomy. His statement that otorrhea is more frequent after adenectomy increases our credulity regarding his other observations. Anyone who has had a background in

otolaryngological experience, in treating disease of children, knows that enlarged adenoids constitutes one of the primary menaces to the middle ear.—Ed.]

Efficacy of Tonsillectomy for the Removal of Focal Infection. In this study by P. S. Rhoads and G. F. Dick** pieces of tonsillar tissue of appreciable size were found in the throats of 73 per cent of persons who had undergone tonsillectomy. That these "tonsil stumps" have considerable clinical significance is shown by the fact that in the fairly large series in which cultures were taken the "stumps" harbored more pathogenic bacteria per gram than tonsils removed for the first time. Also there are clinical cases in which patients with systemic diseases atributable to foci of infection failed to improve after their original tonsillectomy but improved strikingly after removal of the pieces of tonsillar tissue remaining from the first operation.

The complete removal of all tonsillar tissue is necessary when the operation of tonsillectomy is undertaken.

Tonsillectomy in Chronic Arthritis. Two hundred cases of tonsillectomy are reviewed by A. B. Pavey-Smith*. The author has found that a probable tonsil focus can be found in a large number of cases of subacute rheumatism, chronic infective (focal) arthritis, and fibrositis.

When searching for a focus in the tonsils attention should be paid particularly to their history, size, color, crypt contents, and to the associated lymphatic glands; and these points should be carefully balanced before deciding on tonsillectomy: (*a*) In an actively focal tonsil one or more of these points may be negative, but if all five are negative the tonsil should be assumed to be healthy. (*b*) The tonsil of chronic tonsillitis without systemic infection cannot be distinguished from the focal tonsil by physical signs or by present bacteriological methods, but only by inference.

(**) J. A. M. A., Oct. 20, 1928.
(*) Lancet., Jan. 26, 1929.

In selecting cases for operation a history of tonsillitis associated with onset or recurrences is favorable in cases of infective (focal) arthritis, and to a lesser extent in subacute rheumatism, where such a history is commoner.

The younger the patient, and the shorter the duration of disease, the better the prospects, but within very wide limits neither age nor duration are a bar to success. The bacteriological evidence, though insufficient to convict the Streptococcus viridans as the primary infective agent in chronic focal arthritis, increases the suspicion under which this organism already lies.

In the subacute rheumatism group the results are so good that the operation should become a routine part of the treatment, if only as a prophylactic against recurrences and later endocarditis. In cases of chronic focal arthritis, if the balance of evidence, obtained as indicated, condemns the tonsils and they are completely excised, improvement may be expected in 80 per cent of cases.

[We quite concur in the assertion that a remnant of tonsil left after an operation may be more of a menace than was the original tonsil. This is especially true where the remnant becomes sealed over by the scar tissue. The infected focus can usually be recognized: (1) by careful examination and the detection of a slight elevation in the tonsil fossa; (2) by the fact that this imbedded nodule becomes, frequently, the seat of recurring acute infections.

The opposite condition is not infrequently observed where the patient has had the tonsils successfully enucleated and has been advised to have subsequent operations. For what? Because flat nodules of lymphoid tissue in size not larger than the head of a pin, present themselves in the tonsil fossa on the surface of the scar; or because by depressing the root of the tongue one can see the lingual tonsil, which appears in the angle between the radix linguae, and the lateral pharyngeal wall. These conditions do not constitute a menace any more than do

the lymphoid follicles which appear scattered over the postpharyngeal wall in so many instances. The search for and the removal of innocuous lymphoid tissue about the pharynx in cases where the patient has not shown the expected improvement of a systemic infection after enucleation of the tonsils, has lead to a great deal of unnecessary operating.—Ed.]

The Present Status of X-Ray Therapy of the Tonsils. According to H. Fried,† *x*-ray radiation of the tonsils is an established mode of treatment in infections of the throat. The structure of the tonsils consists mainly of lymphoid tissue. All lymphoid tissue being sensitive to rays, the tonsils and adenoids are therefore ideally suitable for radiation.

The use and function of the tonsils are to guard and protect the lower air passages from infection. They absorb toxins from the bacteria and produce antibodies. This insures autovaccination against the type of bacteria which are invading the host. The tonsils are therefore important organs and it is our duty to conserve their usefulness.

The effect of *x*-ray in general and on lymphoid tissue in particular is constant and uniform. The rays have no untoward effect on the human organism if administered in proper intensities. The action of the rays on infected tonsils depends upon their specific effect on lymphoid tissue and the lymphatic elements of the throat, which undergo degeneration and absorption. They produce drainage of the entire infected area and, so to speak, interfere with bacterial growth and development.

Indications for radiation include practically all diseased tonsils except those which are fibrous and those which contain pus, such as peritonsillar abscess or retropharyngeal abscess. In certain diseased conditions such as diabetes and Bright's disease, where tonsillectomy is contraindicated, radiation should be instituted.

(†) M. J. & Record, Jan. 2, 1929.

The cry against this procedure on account of producing a fibrosis has long ago ceased. Today it is not necessary to produce a fibrosis that will render an easy operation difficult. One can destroy lymphoid tissue without fibrous formation by a careful dosage and proper technic. Radiation to the extent of producing a fibrosis is only necessary when operative procedure is not contemplated; then the formation of a fibrosis is desirable.

[The fact that the *x*-ray treatment for the elimination of infected tonsils is gaining so few adherents after the much heralded introduction of this method, speaks for itself. Surgical enucleation of the tonsils is a simpler and more effective method of removing the offending structure. All of us have seen cases treated by the ray treatment with persistence of infection, and the recurrence of acute attacks. Are these all to be attributed to faulty technic? If so, then the technic with proper application seems much too precarious to win popular support. The author speaks with warmth regarding the physiological importance of the tonsil and in the next breath urges the removal by raying. We cannot see any difference in regard to the preservation of the function in the removal of this lymphoid tissue by one method over that of its removal by another. If it is true that the ray treatment can as successfully remove the lymphoid tissue of the tonsil, then it is equally harmful as the surgical enucleation in destroying the function.—Ed.]

The Use of Radium in Diseased Tonsils. After watching results for the past five years, it is the opinion of J. C. Scal‡ that we now have a satisfactory method for the eradication of diseased tonsils by means of radium in the form of radium emanation. This is accomplished without any risk of fatality in inoperable cases. The process has been so improved that it is possible to obtain a complete atrophy of the tonsils without producing any inflammatory reaction or injury to the sur-

(‡) New York State J. M., Jan. 15, 1929.

rounding structures of the tonsil. There is no post-operative hemorrhage, no danger of lung abscess, no aspiration pneumonia, no middle ear involvement. The procedure is practically painless and should be performed in the office, the patient is permitted to return to his occupation and eat his usual meals without any discomfort or pain.

In hemophiliacs the bleeding from the needle puncture is annoying sometimes but is never alarming and usually ceases after local treatment.

The average dose consists of 2.6 mc. radium emanation inserted in a platinum seed in each tonsil. The seed is removed on the fifth day. The macroscopical result of the radium action on the tonsil can be noticed between the third and fourth week after implantation. At this time the tonsil has shrunk to about one-third or one-fourth of its former size. From this time until about the sixth month after implantation a further shrinkage of the tonsil is noticeable and the open crypts become obliterated, thereby eliminating the focus of infection. Where the radon seed has been placed centrally the end result should be apparent between the sixth and ninth months, at which time the tonsil should be distinguished as only a small fibrous mass just behind the anterior pillar.

It is interesting to note that in a great number of cases with rheumatic and arthritic symptoms that were treated by this method, the symptoms disappeared at about ten days or two weeks after implantation. Those in which the symptoms did not disappear admitted relief and improvement. The history of sore throat which was present in practically all cases was eliminated. There were a few cases in which the ideal result was not obtained. These cases always gave a history of frequent attacks of severe tonsillitis complicated by peritonsillar abscess. These unsatisfactory results the author attributes to the fact that because of repeated acute attacks on the tonsils they become partly fibrous in na-

ture and hence remain more or less resistant to radiation since radium exerts action on the lymphoid tissue only. The crypts and their foci of infection in such cases become obliterated.

Aspiration During Tonsillectomy. In this experiment R. V. May, T. W. Thoburn and H. C. Rosenberger[6] measured the amount of aspiration by using iodized oil. The dilution of the iodized oil with olive oil greatly diminished its viscosity, which together with its increased temperature permitted it to flow readily from the syringe and very quickly to become caught up by the pharyngeal secretions. Since only a small amount of the mixture was used and all accessible amounts were removed as soon as instilled, the factor of artificially increasing the bulk of pharyngeal secretions and so favoring aspiration seemed to be practically negligible.

In the authors' clinic the use of suction to remove pharyngeal secretions during tonsillectomy is not practiced as a routine but, in order to investigate its merits in preventing aspiration as compared to their routine technic of removing secretions on gauze sponges, they used suction in cases X and XI with the results that four films in each case showed iodized oil in the tracheobronchial tree.

In cases X and XI they also used atropin sulphate given by mouth one-half hour before operation, the dosage being 1/300 grain in case X and 1/600 grain in case XI. In neither case were the secretions appreciably diminished.

Cases VI, XV, XVII, XXI and XXII illustrated the fact that during an operation aspiration may occur, while at the end of the operation no bronchoscopic or radiologic evidence of the aspiration is demonstrable.

In the series of 25 cases the roentgenograms showed aspiration in 6 of the first 11 cases and likewise in 6 of the remaining 14 cases. The only difference in

(6) J. A. M. A., Aug. 24, 1929.

technic was a full Trendelenburg position and a lighter anesthesia used in the series of 14 cases, while suction and atropin were used in cases X and XI of the series of 11 cases.

This gives an aspiration percentage of 54.5 for the first 11 cases and of 42.8 for the series of 14 cases, while for the entire series of 25 cases the aspiration percentage is 48.

This 48 per cent is of interest in a comparison of the authors' results with those of other investigators who used bronchoscopic methods. In a series of 200 cases, Myerson reports an aspiration percentage of 77.5, while the Dailys in their series of 100 cases report aspiration as occurring in 78 per cent, and Iglauer and his associates in 100 bronchoscopies performed after tonsillectomy report aspiration as occurring in 40 per cent.

In the two cases in which they used suction, marked aspiration occurred. This result should serve to make more cautious those surgeons who place implicit confidence in such a method of preventing aspiration.

The distribution of the aspirated material in the lungs was both interesting and surprising. In four of the twelve cases showing aspiration the aspirated material was limited to the upper right side of the chest while in fifth case it appeared first in this region and later was present in both lungs. In six cases aspirated material was demonstrated in both lungs, while in two cases aspiration was demonstrable as far as the bifurcation of the trachea.

Of the five cases that revealed aspirated material in the lungs at the conclusion of the operation, four cases showed either a complete or almost complete elimination of aspirated material at the end of six hours after operation.

Practically as well as theoretically the use of the *x*-rays in investigating the degree of aspiration during operation on the upper air passages constitutes a method which yields results much more informative

than are the results gained through observations by bronchoscopy and indirect laryngoscopy, which were the methods heretofore employed.

This superiority of the radiologic method seems to be particularly evident in three respects: (*a*) By this method it was demonstrated in several instances that aspirated material may appear in the lung during an operation but at the conclusion of the operation may have been entirely eliminated. By bronchoscopic examination such a postoperative finding would have been presumptive of no aspiration. (*b*) An exact idea of the quantity of material aspirated may be learned. (*c*) A very exact observation of the dispersion of the aspirated material may be readily made.

It seems evident from this and other investigations that the incidence of aspiration, particularly during tonsillectomy done under inhalation anesthesia, may be diminished by the adoption of: (*a*) The extreme Trendelenburg position. (*b*) Constant and thorough removal of all pharyngeal secretions. (*c*) Choice of types of anesthetic and operative technic which cause the appearance of a minimum amount of mucous secretions and hemorrhage. (*d*) The degree of anesthesia, which in part at least preserves the irritability of the laryngeal and tracheal reflexes.

The location in the lungs of aspirated material is variable. The frequency of aspiration solely into the right upper portion of the chest is such as to warrant further investigation. When aspiration occurs, most or all of the aspirated material is eliminated during the six hour interval following operation.

Just as Myerson in 1922 stated in his conclusions to his pioneer work in this problem, so the authors also admit that some aspiration is unavoidable in all operations requiring an inhalation anesthetic but that a technic is possible, as demonstrated here, which reduces this likelihood to a minimum.

[Inhalation of infective material from the tonsils dur-

ing operation does not appear to be the only cause for pulmonary abscesses. These conditions do occur under local anesthesia. The fact that brain abscesses occur after tonsillectomy is one reason for believing that lung abscesses occur as the result of hematogenous infection rather than inhalation. I was surprised when abroad last summer, to be questioned by several men regarding this occurrence of lung abscesses after tonsillectomy in this country. Each of these men insisted that they had never observed this complication.—Ed.]

The Pharynx and Nasopharynx

Vincent's Infections. In regard to this condition cultural investigation has brought out these facts: (1) The two organisms of Vincent's infection are, in reality, two forms of the same organism. (2) Vincent's organism is an anaerobe and lives best in a slightly acid medium. (3) The growth of the organism changes the environment so that it is self-limiting but not self-exterminating. (4) Of the two forms, the fusiform is the more resistant; it will live but not multiply under aerobic conditions.

Most cases have been in a more or less run down general condition, indicating that a poor condition of general health in conducive to local infections; also that this infection has a marked general effect.

Of the entire 60 cases which L. J. Moriarity[7] has observed there was not one tobacco chewer. This may be a coincidence, but the author wonders if others have had a case of true Vincent's infection in the mouth of a habitual tobacco chewer.

He has never had a case of Vincent's infection in a mouth where there was no traumatic occlusion. In nearly all cases the points where the disease began and had progressed furthest were the points of poorest occlusion, due perhaps to the lack of cleansing by the

(7) Clin. Med. & Surg., February, 1929.

normal food excursions, and to the already lowered resistance of these points.

In most cases there were few or no signs of the use of the tooth brush or oral hygiene in general. The cases were predominatingly in males. These two facts led the author to conclude that the female is the more diligent in the practice of oral hygiene; also that she is probably not so often exposed to public drinking cups and other germ carriers. None of the cases were above 40 years of age, which indicates it is mainly a disease of the first half of life.

In regard to treatment the author mentions the various drugs used but his conclusions are that oxygen, in the form of hydrogen peroxid, together with thorough cleaning, needed extractions, reparative work and the correction, so far as possible, of traumatic occlusion are the main factors in the treatment of Vincent's infection.

The Etiology and the Etiological Treatment of "Plaut Vincent's Angina." P. Mangabeira-Albernaz[8] notes that Plaut Vincent's angina is a pharyngeal localization of fusospirochetosis. The disease is produced by the association of the fusiform bacillus of Le Dantéc with a spirocheta which may be called Vincent's, in default of an exact microbiological classification.

The etiological treatment of the disease calls for five conditions to be met by the drug which is used. These conditions may be summarized in the following five requisites:

1. The remedy employed should be absorbed to a greater or lesser extent by the tissue; that is, it should penetrate in order that its action be felt upon the deeper tissues and on the surface.

2. It should be antiseptically active for an appreciable time. This means that the remedy should not be immediately resolved by contact with the tissue, as hap-

(8) Laryngoscope, January, 1929.

pens, for example, with hydrogen peroxid, perborate of sodium, etc.

3. It should be neither caustic nor destructive. These qualities unfortunately are often and unwisely made use of in the treatment of disease. If, however, tissue is destroyed the field for the multiplication of germs is increased; for unless the cauterization be very extensive, the germs present, not only on the surface, but in the deep tissues, will not be reached. Such thorough caustic action is not always practical.

4. It should have a dissolvent action upon the necrotic tissue characteristic of the lesion.

5. Its antiseptic action should be specific upon one or other component of the symbiosis, for if one of these is eliminated the symbiosis is destroyed. The antiseptics directly acting upon anerobic bacilli (of which the fusiform bacillus is a variety) are the oxidizing agents, and their value has not been thoroughly proven on the living subject; for it is rare to find an anerobic germ which cannot live as aerobic. The same is not the case with regard to the spirocheticidal agents, the antiseptic action of which is more specific than any other known in therapeutics.

If one studies the therapeutics in vogue in the so-called ulceromembranous angina, it is seen how far specialists have come from satisfying the above-mentioned conditions. This perhaps is the reason why Plaut Vincent's angina has called forth by itself a greater diversity in treatment than all other infections of the pharynx put together. It is evident that in mild cases "any antiseptic will do," as Escat says; but, unfortunately, the specialist does not always meet simple cases. Hence arose the practice of violent therapeutics with the salvarsan administered intravenously, a treatment which at the present, should only be resorted to in the most exceptional cases.

The only remedies which meet all the five conditions mentioned in a high degree are: the bismuth substances

and the arsenobenzols. Bismuth has many advantages over the latter; it is less toxic, more powerful, more economical, and is immediately and certainly sedative, allaying the characteristic pain. The bismuthic substances locally employed are, therefore, the best treatment of Plaut Vincent's angina.

The author's treatment consists of daily painting the lesion with 30 per cent salve emulsion of bismuth tartrate. The severe cases call for three treatments at most. The patient gargles with any mild antiseptic every two or three hours.

Agranulocytic Angina. Five illustrative cases are reported by W. C. Hueper and D. O'Connor[9]. From a study of their cases the authors noted that the first three patients had symptomatology and pathology very similar to those described by Schultz. The diagnosis of the last two cases could not be regarded as definite on account of insufficient clinical and pathological data. But at least they were highly suspicious of this disease. All five cases took a fatal course. Three women and two men were involved. The ratio of frequency between women and men is according to the authors' investigations 3.5:1. The age varied from 36 to 79. There was no evidence of any contagiousness observed. The investigations made on the present cases did not allow any positive contribution to the question of etiology. The infectious origin and septic character of the disease as asserted by numerous authors seemed not proven. The presence of streptococci or other bacteria in the blood is not considered by the writers as a primary condition, but as a secondary one due to an invasion of these bacteria through the necroses in the mouth, as also observed in leukemias. The unknown toxic element active in this disease does not only injure the granulocytic system but also the lymphatic one, as evident from the marked absolute decrease of the lymphocytes in the blood and the atrophy of the lymphatic tissue in the spleen

(9) Laryngoscope, October, 1928.

and the lymph nodes. The reticuloendothelial cells seem to undergo a compensatory hyperplasia. All cases reported by other authors as "agranulocytoses" which developed this symptom complex following a purulent infection—otitis media, sinus infection, endocarditis, cellulitis, lympangitis, gluteal abscess, infected carcinoma of uterus, syphilitic ulcer of nasal septum, thrombosis of femoral vein, etc.—and showing evidence of suppuration, generalized hemorrhagic diathesis, secondary anemia, myelocytic reaction in the blood and bone marrow cannot be recognized as essential agranulocytoses, but are probably more correctly classified as septic infections with an agranulocytic symptom complex, which is also observed in many other diseases, as aleukia, pernicious anemia, abdominal lymphogranulomatosis, carcinosis of the bone, poisonings with benzol, salvarsan, roentgen rays, thorium-x, etc.

Agranulocytosis with Recovery. Agranulocytosis is still uncommon enough to excite interest in spite of the fact that more than fifty cases have been reported since Schultz described the syndrome in 1922. The disease usually begins abruptly with sore throat, fever, chilly sensations, aches and prostration. The physical abnormalities are typically (1) a bleeding ulceration of the mouth with a membrane often simulating that of diphtheria; (2) enlargement of the liver and spleen; (3) occasional swelling of the inguinal lymph glands, and (4) ecchymosis and herpes. The blood count shows a marked leukopenia, often less than 1,000 white cells being present. The polymorphonuclear series is chiefly affected, the proportion of these cells often falling to 1 or 2 per cent. Since more than 90 per cent of the reported cases have proved fatal, W. B. Blanton[1] thought it worth while to record one in which recovery took place.

History.—A man, aged about 60, had been suffering with a progressive sore throat for more than a week,

(1) J. A. M. A., June 22, 1929.

the chief complaints being general weakness and pain on swallowing.

Examination.—The mucous membrane of the throat was red and swollen. The tonsils were also red and enlarged. There was no slough or ulceration; the cervical glands were tender and enlarged. Temperature readings averaged 101 F.; the pulse and respiration were only slightly altered. No enlargement of the liver or spleen was noted. Examination was essentially negative in other respects.

Progress.—For two months the patient showed a gradual progress toward recovery. The inflammation of the tonsils and pharynx slowly subsided under aspiration and topical treatment. The neck, however, began to swell more, and became red and indurated. After two weeks the indurations on both sides of the neck were quite extensive and hard. Fluctuation developed and was incised and drained, yielding yellow staphylococcic pus. Fifty cubic centimeter doses of a leukocytic extract were given daily until improvement in the blood count was noted. After his recovery, the patient was found to have also a carinoma of the rectum.

Laboratory Examination.—The urine was clear, amber and acid, and showed a specific gravity of 1.020, a moderate trace of albumin and a faint trace of bile; no sugar or acetone, nor pus or blood was present, but many hyaline and granular casts were observed. When the patient was first seen the blood count was as follows: white blood cells, 1,000; hemoglobin, 75 per cent; lymphocytes, 96 per cent; polymorphonuclear leukocytes, 4 per cent. The next day the blood count was: red blood cells, 4,560,000; hemoglobin, 75 per cent; white blood cells, 1,200; lymphocytes, 34 per cent; transitionals 13 per cent; polymorphonuclears, 50 per cent. Two days later the red blood cells numbered 4,000,000, with 70 per cent hemoglobin; the white blood cells, 3,400; lymphocytes, 30 per cent; transitionals, 2 per cent, and polymorphonuclears, 65 per cent. Two

days later the red blood cell count was 4,240,000; hemoglobin, 80 per cent; white blood cells, 6,200; lymphocytes, 19 per cent; transitionals, 4 per cent, and polymorphonuclears, 77 per cent. Blood cultures were sterile. Cultures of pus showed staphylococci.

Epidemic Septic Sore Throat. From a study of the literature B. White[2] concludes that:

1. Epidemic septic sore throat is a definite disease, caused by a hemolytic streptococcus usually of the Epidemicus type, but rarely of a non-identical but closely related type. It is almost exclusively milk-borne but infection by contact though unusual is not impossible.

2. The disease may be frequently diagnosed as tonsillitis and more often as influenza.

3. The symptoms are characteristic of a hemolytic streptococcal infection. At first there is a severe and acute intoxication, sometimes disappearing abruptly with no sequelae. Often there is a remission followed by all the septic complications which virulent hemolytic streptococci are capable of causing.

4. Different outbreaks vary in extent and severity, depending upon the number of consumers of the infected milk, the age of the consumers, possibly upon the virulence of the streptococcus, and upon the promptness of the measures taken to remove or destroy the infection in the milk supply.

5. In the majority of outbreaks the infective milk or cream was raw, and in the few instances where supposedly pasteurized milk was distributed it has always been found that this process was not properly carried out.

6. The best evidence shows that the sources of the infection is one or more quarters of cows' udders harboring or propagating hemolytic streptococci of a human —not bovine—type, and what is more important, this infection may exist and persist without producing any systemic symptoms in the cow or even any of the more

(2) New England J. Med., April 18. 1929.

conspicuous signs of mastitis. Streptococcus laden milk may, therefore, be drawn from such an infected quarter and be included in the supply without attracting the attention of the milker.

7. While some authors claim that human carriers or persons having or recovering from sore throat may directly contaminate the milk supply, it seems more and more probably that they pass their infection to the teat of the cow and that the cow's udder may become the reservoir of these streptococci.

8. There is little direct evidence bearing on the manner in which the infection survives in the inter-epidemic periods. We may assume either the existence of human or bovine carriers or that the pyogenic hemolytic streptococci of the ordinary sore throat may on transference to the udder of the cow take on new characters and an increased virulence for man.

Anatomic Investigations of Dry Catarrh of the Pharynx. This subject has not heretofore been investigated anatomically according to Hofer[3]. Dry catarrh is either primary or secondary to atrophic processes in the nose. The question is still open whether pharyngitis sicca is secondary to rhinitis sicca or due to the same cause.

Histology of atrophic disease in the nose shows: (1) metaplasia of ciliated epithelium into squamous, (2) inflammatory changes in the mucosa, (3) degeneration of the mucous glands and partly of the blood vessels and (4) changes in the bone beneath the mucosa. The author reports several cases in which sections were taken from the mucosa of the mesopharynx, and shows three of these and one normal section. The changes are largely those of inflammation, with hyaline degeneration. Especially the elastic tissue seems to have degenerated, but this must be cautiously accepted as this tissue normally varies greatly in extent. Of particular note, however, is the absence of degeneration of the mucous glands as seen in the nose. The glands are found dilated and filled

(3) Ztschr f. Hals-, Nasen- u. Ohrenh., 18: 610, 1927.

with secretion. In this respect the pathologic process differs from that of dry catarrh in the nose, and also in that there does not seem to be any characteristic process in the mucosa of the throat.

[*Pharyngitis sicca* may at times be dependent upon nasal conditions and not develop simultaneously with them, as is evidenced by the fact that this troublesome symptom occasionally follows as a sequel of *inferior* turbinectomy. Another point in connection with pharyngitis sicca is, that it seems to be found quite frequently associated with diabetes.—Ed.]

Septic Sore Throat. According to D. J. Davis[4] the present status of the epidemiology of septic sore throat is much the same as it was twenty years ago. Outbreaks are rare. They occur here and there and probably will continue to do so. No doubt, epidemics are now being observed that years ago would not have been recognized.

Modern methods of pasteurization and the careful supervision of certified milk products, together with new methods of identifying Streptococcus epidemicus should do, and possibly have already done, much to prevent epidemics. Much still remains to be done, however, in the control of milk supplies before the disease can be completely eradicated.

Streptococcus epidemicus seems to be the specific cause of the disease and is so regarded by those who have most carefully studied it. Studies of the more recent epidemics by various workers indicate that the usual if not the only route of transmission of the streptococci is from a human being to the teat and udder of a cow, through contact. Here they incubate and rapidly multiply. They then pass out in the milk directly to the throat of the consumer.

Strains of Streptococcus epidemicus yield a specific soluble toxin which varies to some degree from the toxin of the scarlet fever streptococcus.

(4) J. A. M. A., Sept. 28, 1929.

[The tracing of infection in epidemic sore throat to infected milk and the prevention of such epidemics by pasteurization, is one of the noteworthy contributions of modern medicine.—Ed.]

Operations for Malignant Disease of the Pharynx. Epitheliomata occurring in the laryngeal portion of the pharynx are classified by W. Trotter[5] into the following four well-defined groups, for each of which a special type of operation is necessary:

1. Superior group—growths of the epiglottis or the glosso-epiglottic fossa.
2. Lateral group—growths primary in one of three situations: (a) the aryepiglottic fold, (b) the pyriform sinus, (c) the lateral pharyngeal wall.
3. Posterior group—growths of the posterior pharyngeal wall.
4. Inferior group — growths of the postericoid pharynx.

From the technical point of view, the last two groups are definitely marked off from the first two as a successful operation upon them must necessarily include a definite plastic procedure to replace the excised part. These two groups therefore fall into a distinct chapter of surgery of the pharynx and are not discussed by the author.

The author prefers sharp dissection to diathermy because of the finer technic possible with the scalpel. In cases of growths of the superior group, gland dissection may precede or follow the operation. In cases of growths of the lateral type, the glands may be removed concurrently with the operation on the growth or later. Bilateral removal of the lymph glands is not necessary; unilateral removal gives excellent results. Sepsis is a source of danger. The best prophylaxis against it is an edentulous mouth. A tracheotomy with a circular opening precedes the operations.

For growths of the superior group, the author per-

(5) Brit. J. Surg., January, 1929.

forms a median (anterior) translingual pharyngotomy. The incision passes exactly in the median line through the lower lip and the chin to the tip of the thyroid cartilage. Following the interval between the geniohyoid muscles, the lower jaw is sawed in two, the tongue divided, and the floor of the mouth split. The neoplasm then comes into the field and excision is begun by lateral dissection until it is separated from the tongue. It is then pulled upward and after division of the aryepiglottic folds the epiglottis containing the tumor is divided transversely just above the neoplasm outward. The hyoid bone to which the growth is still attached is disarticulated from the greater cornua and the tumor is freed. Closure is usually easily accomplished between the tongue and larynx, and the midline incision of the tongue and lip is sutured. The submental wound is left open for drainage.

For lateral epitheliomata the approach is made through a 4 to 5 in. vertical incision running downward from a point behind the angle of the jaw. Gland dissection may be performed at this time and the external jugular vein removed. The pharynx is then exposed by vertical division of the infrahyoid muscles, the superior laryngeal vessels and nerve are divided, and the great cornu of the hyoid and the ala of the thyroid are exposed. If the growth has not involved the cartilage, these structures are divided vertically and removed. If the cartilage is involved, the ala must be removed with the growth. Depending upon the site of the tumor, an appropriate incision is made into the pharynx and the growth removed under direct vision. The wound in the pharynx may be closed primarily, but the skin incision is left open. If pharyngeal closure cannot be made, the edges of the mucosa are sutured to the skin. The resulting fistula can be closed easily after three or four weeks.

In all cases the patient is fed through a rubber catheter for a few weeks until normal swallowing is

possible. The tracheotomy tube remains in for about a week.

[A more common form than that discussed by the author is the malignant growth which develops in the vault of the pharynx. Such seem to us to be beyond the reach of any surgical manipulations, and one is forced to rely upon radium.—Ed.]

Malignant Tumors of the Nasopharynx. F. K. Hansel[6] reports a series of four cases showing that the early diagnosis of malignant tumors of the nasopharynx is often difficult on account of the small size of the primary growth and the lack of nasopharyngeal symptoms. Extranasal symptoms are commonly present in the early stages of the disease. The early signs and symptoms are usually pain in the eye, forehead, side of the face and temporal region, toothache, earache, deafness, tinnitus, sense of fulness in the ear, diplopia, blindness, proptosis, paresthesia of the face, enlarged cervical glands, dysphagia, aphonia, hoarseness and distant metastases.

The cranial nerves are usually involved extracranially. Those passing through the sphenoidal fissure are affected most commonly, particularly the sixth nerve. The fifth nerve is next most commonly involved.

The nasopharynx should always be most carefully examined in all patients with unexplained palsy or irritation of the cranial nerves, in patients with enlargement of the cervical glands and in those with metastatic malignant disease in which an apparent primary lesion is not present.

Pathologically malignant tumors of the nasopharynx present a highly malignant type of lesion with a striking lack of cellular differentiation and offer difficulties of exact classification.

The treatment consists in the application of radium and *x*-ray therapy. The prognosis is grave. Three of the author's cases ended fatally.

(6) Arch. Otolaryng., January, 1929.

[In tumors of the vault of the pharynx, the most common early symptom is referable to the ear. A tubotympanic process quite similar to that which occurs in adenoids, is the condition found: closure of the tube with a serous exudate in the tympanum.—Ed.]

Retropharyngeal Abscess in Infants and Children. A series of 55 cases of retropharyngeal abscess is reported by H. M. Greenwald and C. R. Messeloff[7] and analyzed, and the literature is reviewed. The condition is not uncommon in early infancy and childhood. It is more common in the first year of life than later. It is equally divided bteween the sexes and occurs most frequently in winter and spring, when respiratory infection is commonest. Retropharyngeal abscess should be suspected in every patient presenting an enlarged cervical gland and the diagnosis should be determined by a digital examination of the pharynx. Retropharyngeal abscess is not an innocuous disease, as demonstrated by the fact that the mortality rate was 7.3 per cent in the authors' series. The danger of operating in the stage of nonsuppurative lymphadenitis, as well as the dangers of not operating when fluctuation is present, are pointed out.

Adenoids in Adults: A Clinical Study. In the experience of R. F. Nelson[8], of 19 cases of demonstrable adenoids in adults, 12 were of clinical importance. Ten per cent of 95 adults seen consecutively with chronic tonsillitis had adenoids. Tonsillectomy had been performed in six cases, without attention being given to the adenoids.

Frequent acute rhinitis and nasal congestion without demonstrable infection of the sinuses were present in more than half of the cases. In 12, nasopharyngeal hyperemia seemed at least partly due to infection of the adenoids, and in 7 a discharge of an inflammatory secretion independent of sinusitis was present. Several pa-

(7) Am. J. M. Sc., June, 1929.
(8) Arch. Otolaryng., July, 1929.

tients had disease of the middle ear related to the adenoids.

Adults should be even more carefully examined than children, and adenoidectomy should accompany other operations on the nose and throat when adenoids are found. The conception that they do not occur in a pathologic state in adults should be guarded against.

[The surprising thing about adenoids in adults is the rather rare occurrence of this condition, since it is found so frequently in childhood. Apparently enlargement of the pharyngeal tonsil in childhood frequently disappears in the adult.—Ed.]

Diseases of the Larnyx and Trachea

A New Laryngologic Phantom Devised by Franz Haslinger. I. I. Alper[9] reports this phantom, an instrument which may be used at medical schools and postgraduate institutions to better acquaint the students and practitioners with the anatomy and physiology of the larynx and to offer them an easier method of perfecting themselves in the various laryngeal manipulations and operations by indirect illumination.

The invention is a series of models or phantoms ranging from the model for simple localization of the various normal anatomic landmarks in the larynx, to replicas of the most severe and complicated laryngeal disease. (Fig. 67).

The phantom is the simple one that has proved so instructive and interesting to many American laryngologists who have done special work in Vienna. As the illustration shows, it consists of an ordinary plaster of paris head, with the mouth wide open and an outstretched rubber tongue, as when a laryngoscopy is being performed by indirect illumination. The mouth has two rows of teeth, a red rubber soft palate and uvula,

(9) Arch. Otolaryng., June, 1929.

the anterior and posterior pillars and part of the posterior wall of the pharynx. This is mounted on an iron stand—which is simply an upright rod on a round metal base.

Mounted on the rod to the back of the instrument, somewhat beneath the head, is a brass cylinder, which is so placed that when it is swung around in front it

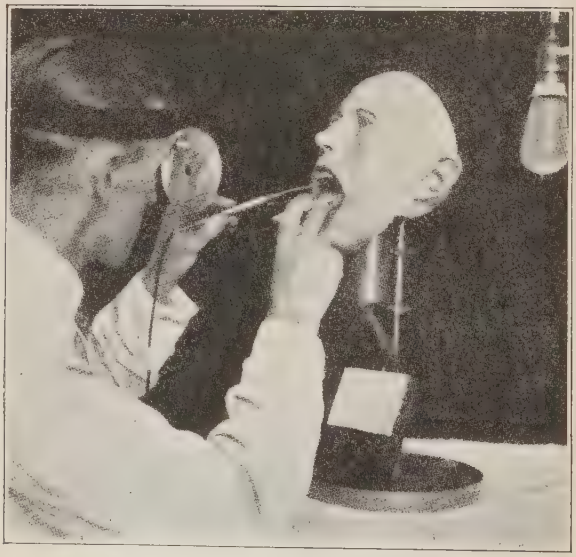


Fig. 67—Laryngologic phantom.

fits exactly under the model where the larynx would normally be present. Inside of this cylinder is the model of a normal larynx in the respiratory position, i. e., with the cords apart. This larynx is ingeniously made of a pink wax-like substance and has at various points of its surface small protruding wire ends. These wire ends are placed at seven strategic points: (1) vallecula, (2) anterior commissure, (3) posterior commissure, (4) right ventricular band, (5) left ventricular band, (6) right sinus pyriformis and (7) left sinus pyriformis.

Connected to these points and running downward, out of sight, are a corresponding number of insulated wires which are in circuit with a small pocket flashlight battery, a dial board with seven calibrated contacts and a small electric bell. There is also in the circuit a metal probe mounted on an ordinary metal instrument handle, and curved for intralaryngeal manipulations. There is a chart attached to the apparatus showing which part of the larynx is connected by which wire (1 to 7) to the bell and the battery.

If one wishes to examine the vallecula wtih the probe, the dial is turned to the contact No. 1 which sends the electric current through to the wire terminal in the vallecula. After focusing the head mirror on an ordinary laryngeal mirror which is placed in the phantom's mouth in the usual manner, as for an indirect laryngoscopy, the vallecula is examined with the probe that is attached to the phantom. When the probe is in the proper region, i. e., the vallecula, it comes in contact with the small protruding wire tip that is present there, thereby completing the circuit, and the bell rings. Touching any other part of the larynx or any other terminal will not ring the bell if the dial is on contact No. 1. In a similar fashion, by adjusting the dial to the other numbers in succession, and then by touching their corresponding laryngeal counterparts with the probe, the circuit is complete and the bell rings.

It is evident that with a few minutes' daily practice on this model, the beginning laryngologist will in a short time "be at home in the larynx" and be able to perform with a greater degree of confidence and skill the variety of intralaryngeal manipulations and operations that an otolaryngologist is called on to perform in his daily practice. It is also to be considered that with the perfection of one's technic and with the complete intralaryngeal orientation that one can obtain by this exercise, the indication for direct laryngoscopy would be greatly diminished, especially for the simpler opera-

tions in the larynx. Lastly, but by no means least, this method of teaching the anatomy and physiology of the upper respiratory organs would do a great deal to remove the cobwebs that exist in the minds of almost all medical students about the structure and operation of these delicate but important organs, despite the best of didactic but abstract instruction on these subjects that now is given in many of the medical schools.

Therapeutic Indications in Laryngeal Tuberculosis. In discussing the pathogenesis of laryngeal tuberculosis H. Caboche[1] reviews an earlier communication in which he presented evidence indicating that as a rule tuberculous infection of the larynx occurs by way of the blood stream from tuberculosis primary in the lungs. He believes, however, that the sputum plays an important part in irritating the lesion already established by the organisms of secondary infection which usually accompany the tubercle bacilli in the sputum.

The treatment must be directed toward the pulmonary tuberculosis and the general condition as well as toward the laryngeal lesion. The general treatment must include complete rest, fresh air, and proper nourishment. To these may be added pneumothorax according to Forlanini's method. The hygieno-dietetic cure should be ordered for every patient who can afford it.

Of 48 patients treated by the author by ignipuncture since 1910, 8 recovered and were followed for from ten to fifteen years. All of these patients except one who at the same time followed a rest and fresh air cure in the country were ambulants.

Local treatment of the laryngeal lesion includes the silence cure, laryngotracheal instillations with tracheofistulization, and artificial pneumothorax. The silence cure places the affected parts at rest, but is difficult to apply in hospital cases and is practically impossible to apply in ambulant cases. In two cases of periglottic laryngitis seen by the author the condition responded

(1) Arch. Internat. de Laryng., Sept.—Oct., 1928.

to instillations of medicaments by means of a cannula through the cricothyroid membrane. Even if certain cases of secondary tuberculous infection of the fistula are not taken into consideration the author is of the opinion that instillation through the natural passages gives results as good as those obtained with tracheofistulization. However, tracheofistulization is of value when ignipuncture or a local operation must be undertaken on an infected larynx on account of stenosis. The solutions injected either *en masse* or drop by drop are gomenol oil (5 to 20 per cent), creosote oil (2 to 5 per cent), or oil of vanilla essence.

According to numerous reports, pneumothorax is of value in laryngeal tuberculosis and when used in the treatment of pulmonary tuberculosis it tends to prevent the development of tuberculosis of the larynx. The author reports in detail four cases of laryngeal tuberculosis in children which were successfully treated by artificial pneumothorax and were followed for more than a year after the treatment.

Surgical treatment by laryngectomy and laryngofissure followed by curettage of the exposed lesions is to be rejected. Tracheotomy cures a certain number of cases, but in many more it aggravates the condition. It is indicated only when asphyxia threatens or as a measure of prudence before an endolaryngeal operation. Tracheofistulization serves the same purpose better. Intubation is used only during or following a local operation. In cases of progressive tuberculous stenosis it is too traumatizing. Resection of the recurrent laryngeal nerve has been done for the purpose of immobilizing the larynx. Endolaryngeal surgery has been largely abandoned.

With the galvanocautery it is possible to obtain a destructive and sclerosing effect. The cauterization is also hemostatic. It is extremely easy and its results are unquestionably good. The treatments may be so spaced

as to cause the patient very little fatigue. The effect on the dysphagia is often remarkable.

The results obtained by general irradiation with the arc lamp according to the Danish method or by irradiation of the neck with the quartz lamp according to Philip's method show that these procedures are among the most efficacious. The Worms treatment has better effects if it is combined with ignipuncture. Actinotherapy is not always without danger. The benefits of heliotherapy are undeniable. Malström obtained improvement from local injections of an aqueous extract of irradiated oil. Radiotherapy of laryngeal tuberculosis is still an uncertain method. The indication for diathermocoagulation is limited to the non-progressive forms of laryngeal tuberculosis, limited epiglottitis without involvement of the aryteno-epiglottic folds, vegetations, and tuberculomata. The use of the high frequency current promises to be a simple procedure for the treatment of tuberculosis of the larynx. Hot air therapy has been very little employed and its results are not convincing. Cinnamic benzyl ether given by intramuscular injection is at least a harmless adjuvant. The author reports six cases treated by such injections. Gold salts may also be of value.

Tuberculin is dangerous. The methylic antigen of Boquet and Nègre is a valuable aid. Three cases in which it was used are reported. The application of cod liver oil often results in cicatrization of the ulcerations and relief of the edema and dysphagia.

In the treatment of the pain the galvanocautery gives the best results. Diathermocauterization, actinotherapy, heliotherapy, and roentgenotherapy are also of value. The high-frequency current seems to have a marked analgesic effect. Decortication of the laryngeal mucosa has been suggested by Saupiquet. Physiological blocking of the superior laryngeal nerve by the injection of alcohol around the trunk is not dependable and sometimes produces laryngeal edema. Neurotomy of the

superior laryngeal nerve has not given good results.

Herpes Laryngis. Because of the rarity of this condition H. R. Landon[2] reviews the literature and presents a case at point. The patient was a man, aged 29, who complained of pain on swallowing. The mucous membrane of the mouth appeared to be normal, except for the presence on the anterior surface of the right posterior pillar of a grayish-white, round ulcer about 2 mm. in diameter, and surrounded by a bright red areola. When the tongue was depressed, two similar, but smaller, ulcers were seen at the base of the tongue, to the left of the midline.

It was felt that these ulcers could not account for the acute pain. Laryngeal examination, however, revealed that the posterior surfaces of the aryepiglottic folds, both the valleculae and the pyriform sinuses, as well as the surrounding lateral pharyngeal walls, were studded with round vesicles filled with a yellowish-white, turbid material (Fig. 68). An inflammatory border of red surrounded each vesicle. The aryepiglottic folds were of a deeper color and were thicker than usual. The false and true cords were practically normal. The epiglottis was moderately congested. At the end of a week the patient felt well, and examination showed a normal throat and larynx.

As regards the etiology of this condition the majority of authors believe that it is an acute infection with predisposition for herpetic involvement of the larynx.

Pathologically, within forty-eight hours, seldom longer, when the inflammation of the mucous membrane is at its highest, the vesicles appear. They are round, from 1 to 2 mm. in diameter, and are surrounded by a reddish border. They tend to appear in groups and are discrete, but occasionally several may become confluent and after rupture may leave an irregular ulcerated area.

At first these vesicles are filled with a clear serum,

(2) Arch. Otolaryng., July, 1929.

but the contents soom become turbid and are replaced by a yellowish, purulent fluid. In the next stage the vesicle bursts, leaving a grayish-white superficial base surrounded by a reddish border.

The involved tissues, usually the posterior wall of the laryngeal box, the arytenoid cartilages and the epi-

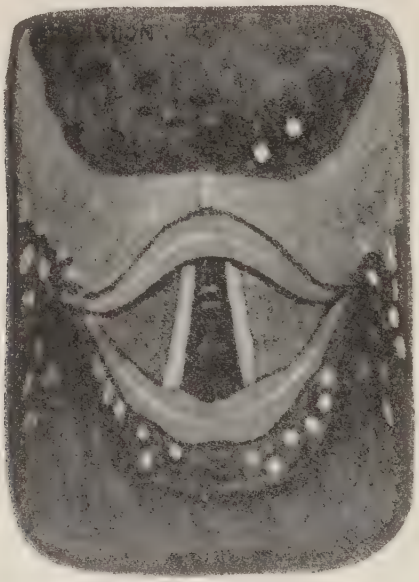


Fig. 68—Herpes on larynx and surrounding structures.

glottis, show an associated inflammatory reaction and are puffed up by edema and exudation. In a week, at most in two weeks, the process terminates in complete recovery, leaving no scars.

The aryepiglottic folds, the arytenoid cartilages and the epiglottis are the sites of predilection. The true cords and the ventricular bands commonly escape, and at most show a mild inflammatory reaction. Usually the pyriform sinuses and the lateral walls of the pharynx surrounding the sinuses also are the site of the eruption.

Occasionally, the base of the tongue may show scattered vesicles. In fact, it is rare for the vesicles to appear on the larynx first; it is still rarer for the larynx only to be involved. Recurrences are extremely rare.

The disease is ushered in by mild chills and moderate fever; these symptoms are seldom intense. A burning and scratching sensation in the throat is complained of early. Soon pain is felt on swallowing, and within forty-eight hours the full symptoms are present. Swallowing becomes painful, so that even liquids may be refused by the sufferers. The temperature seldom ranges above 102 F., the pulse rate being proportionate. Hoarseness is common; it is slight, but may become noticeable.

With the appearance of the vesicles, the symptoms are intensified. Pain in the throat, particularly on swallowing, is prominent. Within two or three days the vesicles rupture, the symptoms diminish rapidly in intensity, and at the end of ten days, seldom longer than two weeks, complete recovery occurs.

Many diseases bear a superficial resemblance to herpes laryngis. In persons with eruptive fevers such as variola and varicella, vesicles are commonly found on the mucous membrane of the throat and larynx, but the coincident presence of the eruption on the skin definitely differentiates these conditions from herpes laryngis.

Pemphigus may give rise to herpes of the throat and larynx, but here, again, the presence of the eruption on the skin makes the diagnosis definite. Cases of primary pemphigus of the larynx were reported by Schmidt.

Eczema of the throat and pharynx also bears some resemblance to herpes laryngis, but the vesicles that are present are small and appear in great numbers.

Syphilis, tuberculosis and cancer are ruled out by the history, the appearance of the ulceration and, in case of doubt, examination of the sputum for the tubercle bacillus; the Wassermann test for syphilis and his-

tologic examination of the tissue for cancer help in the differential diagnosis.

Diphtheria is ruled out by the appearance of the throat and by a smear showing the diphtheria bacillus.

No doubt many other conditions involving the mucous membrane of the larynx may resemble herpes laryngis, but in practically all cases reported the picture is definite and unmistakable.

The prognosis is uniformly good. In all the cases reported, a cure was effected. Rest in bed and appropriate hygienic care are essential. Free catharsis and depletion are indicated as a general routine measure.

For the amelioration of pain in the throat, an ice collar and inhalation of medicated steam may be used. Ingestion of small pieces of ice also brings comfort. To relieve the pain during swallowing, the throat and larynx may be sprayed with a 5 per cent solution of cocain preceding the ingestion of food. Salicylates are given for the fever and pain. Talking is to be avoided.

Laryngeal Cancer. E. Mackenty[3] again emphasizes that if the public mind could be oriented on one fact—that progressive hoarseness is a danger signal—and if the medical profession would urge a thorough and competent investigation of this danger signal; if the entire truth were told about radium, and if the laryngologist would heed the dictates of general surgical measures in the treatment of persons with cancer, i.e., radical removal, laryngologists would be doing their honest best with their allotted 5 per cent share of patients with this dire disease and would eradicate to a large extent the unspeakable misery attendant on uncontrolled laryngeal cancer.

The author fears that cancer is increasing, at least in this particular field. A certain percentage of this increase may be accounted for by greater knowledge and alertness on the part of the medical profession. This fails, however, to account for the increased incidence

(3) Arch. Otolaryng., March, 1929.

of cancer in young persons, especially in women, and in old people. In his earlier experiences the author found that cancer was limited almost entirely to the middle-aged; it is now common in persons in their thirties and even in their twenties, and it is not rare in persons between 75 and 80 years of age.

Carcinoma of the Larynx. In reporting on seventy cases H. B. Orton[4] states that he has seen no good come from radium in cases of carcinoma of the larynx, and in extrinsic carcinoma, lateral pharyngotomy or subhyoid pharyngotomy, diathermy, and resection of the glands may give some hope for those poor individuals who, otherwise, go on to a very painful existence and exit.

A plea is made for early diagnosis of cancer of the larynx; that every individual with hoarseness of a month's duration should have a thorough laryngeal examination made; that in certain selected cases of intrinsic carcinoma of the larynx, a larynogofissure gives a better chance of cure than for cancer in any other part of the body. In certain selected cases of intrinsic carcinoma, a total laryngectomy should be performed, and in another class of extrinsic carcinoma, if not too much involved, operation, diathermy and resection of glands, and deep *x*-ray therapy should be done.

Intrinsic Cancer of the Larynx; The Lasting Cure by Laryngo-Fissure. St. Clair Thomson[5] shows that of 70 cases a lasting cure of 76 per cent has been obtained without restricting to particularly promising cases. As the indications for laryngo-fissure have not yet been quite established—beyond that of being a suitable operation for many cases of intrinsic cancer — the author thought it right to try it in various intralaryngeal manifestations of the disease. Although this may have impaired the statistical results, it has enabled him to form some clear conclusions as to the indications and limita-

(4) J. M. Soc. New Jersey, March, 1929.
(5) Canadian M. A. J., July, 1929.

tions of the laryngo-fissure route for the eradication of intrinsic cancer of the larynx.

If intrinsic cancer of the larynx is diagnosed early it is best operated on by laryngo-fissure — an operation which should be free from danger to life and followed by an adequate voice and a lasting cure. The only necessities for this consummation are early diagnosis and meticulous care in operative precaution and procedure. By educating the public to pay prompt regard to persistent hoarseness, and by teaching the profession to appreciate the niceties and necessities of early diagnosis, the number of laryngo-fissures and the proportion of lasting cures will steadily increase, while the need for laryngectomy will as progressively diminish.

In other regions of the body there may be better remedies than surgery can supply. In intrinsic cancer of the larynx other, simpler and surer, remedies no doubt will one day be discovered; but, at present, there is no better way than surgery and the laryngo-fissure route. By this one can secure results which have not been surpassed in the treatment of cancer in any other internal region of the body.

Radium Treatment of Intrinsic Carcinoma of the Larynx. Other methods having proven unsatisfactory N. S. Finzi and D. Harmer* now apply the radium in conjunction with their operative procedure.

A skin incision is made over the thyroid cartilage, starting at the center of the hyoid bone and extending outwards and downwards along the posterior border of the thyroid cartilage. The infrahyoid muscles are exposed and split longitudinally. The lateral aspect of the thyroid cartilage is exposed; the perichondrium covering it is divided and stripped backwards and forwards. The greater part of the cartilage is then resected. Thus a large window is made in the thyroid cartilage, but a framework is left consisting of the four margins. By this means the outer surface of the growth covered by

(*) Brit. M. J., Nov. 17, 1928.

the perichondrium is exposed. It is important not to destroy this capsule or to cut into the growth. The cartilage is removed for two reasons—to allow the needles to be placed as close to the growth as possible, and to prevent the perichondritis or necrosis which may be caused by the radium.

From five to ten radium needles are thus inserted lying parallel to one another and vertical. To keep them in position the ends of the needles are tucked under the framework of the cartilage. Care is taken that the needles do not penetrate into the growth or into the larynx. At the lower end of the wound, if the growth is subglottic, the needles are pushed inside the cricoid ring, but in this situation the tissues are often so thin that occasionally the needles may perforate the air passage.

Each needle has attached to it a piece of linen thread soaked in a solution of flavine 1 in 1,000. This material seems to cause less irritation than silk or others that have been tried. The threads are all tied together and buried beneath the muscles. Double sutures are inserted into the skin, half of them being tied at once to close the wound completely, and the other half left so that they can be tied later after the radium has been removed. No drainage is employed, and the skin incision is completely sealed with a collodion dressing. If the growth has extended across the middle line, a second window is made in the thyroid cartilage on the opposite side, and needles are buried there also. A low tracheotomy is then performed. This is deliberately made the last stage of the operation to prevent infection of the laryngeal wound. Tracheotomy has been performed in all the cases because the reaction which results from the radium may cause so much swelling that the glottis may become temporarily obstructed. The needles have been left in situ for periods of from four and a half to eight days, according to the dose of radium employed and to the extent of the growth that had to be treated. At the end

of the treatment the wound was found to be infected in every case. Cough has been a prominent feature of all the cases while the radium was in situ, and a good deal of sticky mucus has been secreted in the larynx. In no case has the inflammation extended downwards and caused bronchitis. With one exception, no shock has resulted from the treatment. There has been practically no pain or discomfort, and none of the patients has been seriously ill.

Some swelling and induration of the neck results from this treatment and may persist for a month or two. Ultimately the wounds heal soundly with soft movable scars.

Changes in the growth itself occur rapidly, and even in ten days the lesion may appear less nodular. Often the surface is then coated with a layer of white fibrin, the surrounding parts are generally edematous, and in some instances the swelling may occlude the glottis. Later the inflammation subsides, and after six weeks all signs of growth may have disappeared, leaving the cords symmetrical and equally movable. About this period the tracheotomy tube can usually be removed.

The authors have used a 0.5 mm. filter of platinum containing a small percentage of iridium. The applicators have been in the form of needles 2 cm. and 1 cm. long, containing respectively 1 or 0.5 mg. of radium element. In some cases these needles have contained 0.9 and 0.45 mg. On the average eight needles, seven long and one short, are used if one side only is being treated, and about twelve for both sides. With about 7 mg. of radium element in the wound the needls are left in situ for six or seven days. In some cases about 30 per cent of a full dose of heavily filtered *x*-rays has been given during two or three days immediately preceding the operation.

It is known that if a transplantable animal tumor be given a certain dose of radiation in vitro such a tumor can no longer be transplanted. This is called the lethal

dose; but a lethal dose cannot be administered to the whole of tumor in the human larynx or in an animal because the effect on the surrounding tissues is too severe. By embedding radium in a growth, however, parts of it will receive such lethal dose. Now if an animal tumor which has received in vitro a lethal dose and not very greatly in excess of this be implanted, it is absorbed and immunity to subsequent implantations of the same tumor is conferred on the animal.

One of the authors has advanced the theory that the administration of the lethal dose to parts of the tumor in vivo renders the remainder of the growth more susceptible to moderate doses of radiation. Therefore radium needles or seeds may produce better effects than homogeneous irradiation of the tumor. The tissues are very susceptible to bacterial invasion, so that the most meticulous care must be taken to avoid sepsis. This has been borne in mind throughout. Apart from this action the effect of the rays is selective, the cells of the growth being more vulnerable than the normal cells. The wonderful restoration of the vocal cords, so that it is not even possible to say which side has been diseased, is evidence of this.

Of the 15 cases treated, 14 were males and one female, aged from 45 to 67. Patients were selected who were not too old and who had a reasonable expectation of life. They can be grouped in three classes as follows:

1. Early cases in which the growth was strictly confined to one vocal cord and did not involve either the anterior commissure or the arytenoid cartilage—namely, cases that could have been treated by laryngofissure. In this class there were 8 cases; in 6 the growths entirely disappeared, and the patients have remained well for periods of from one to three years. In all of them the affected vocal cords have become freely movable. In some of them the vocal cords have recovered to such an extent that it is now almost impossible to detect on which side the growths were situated. Such results are

far superior to those that can be obtained by cutting operations such as laryngofissure.

2. Advanced cases, in which the disease was intrinsic but had crossed the middle line in front and involved the other vocal cord; these cases could only have been cured by some form of laryngectomy. There were five cases in this class. One patient has remained cured for four years. In one case the disease in the larynx entirely disappeared and the voice became normal again, but recurrence took place a year later in the tracheotomy wound, and he died eight months afterwards. In one case the growth shrank, but a stenosis of the larynx supervened, and later it recurred, and the patient died twenty-one months after operation. In one no improvement was noticed. One patient died of chloroform poisoning before the operation was completed.

3. Inoperable cases in which the disease had extended into the pharynx or through the laryngeal cartilages into the neck, with enlargement of the cervical glands. In this group there were two cases. In one case the growth entirely disappeared, and the glands, which contained carcinoma, were removed by operation. The larynx remained healthy for two and a half years, but afterwards the vocal cord became thickened again owing to recurrence. In the other case the growth shrank greatly, but the patient died after fifteen months, probably as the result of metastases in the mediastinum.

These results are encouraging, but obviously it is too early at present to be certain to what extent the cures are permanent.

A Two-Stage Laryngectomy. The points of interest in this method of laryngectomy by G. New[6] are: (1) the use of local infiltration anesthesia for the first stage; (2) the median-line incision and splitting of the hyoid bone; (3) the creating of a barrier to infection by means of a clean wound; (4) the opening of the trachea later to infect the wound and allow the patient to immunize

(6) Surg. Gynec. Obst., December, 1928.

himself and become accustomed to the opening; (5) the performing of the second stage of the operation under paravertebral anesthesia and infiltration of the pharynx about 8 days after the first stage; (6) the complete primary closure of the wound of the neck without the usual drains or tubes, inserting the split tube below the tracheal opening; (7) the application of gauze rolls laterally on the neck with pressure to eliminate the space previously occupied by the larynx and to support the pharynx; and (8) the primary healing of the greater part of the wound of the neck and a tracheal opening without the use of a cannula in practically all cases.

Cicatricial Stenosis of the Larynx: A Proposed Method of Treatment with Report of Three Cases. In this method reported by M. F. Arbuckle[7] a low tracheotomy is performed. The larynx and upper trachea are incised in the median line. These structures are next brought into as near normal shape and position as possible. A sea sponge is then placed in the larynx, surrounded on all sides by a Thiersch graft. The obturator and graft are anchored by a through and through stay suture tied on the outside. After a week the suture is cut and the obturator removed through the tracheotomy wound. Retrograde observation through the latter usually reveals that the graft has taken. Up to the present the ultimate results obtained seem satisfactory.

Stenosis of the Larynx: A New Method of Surgical Treatment. E. Schmiegelow[8] reports the results of this method in eighteen cases. In children, the operation is performed with the patient under deep sleep from ether or chloroform; in adults it may be done with the patient under local anesthesia. First of all, the tracheal cannula is removed as far from the larynx as possible by means of inferior tracheotomy. From there, the stenosis is split from the outside by a laryngotracheal fissure.

(7) Arch. Otolaryng., December, 1928.
(8) Ibid., May, 1929.

The stenosis is thereby exposed—freely—and its form, character and extension are carefully examined.

If one has to do with diaphragmatic strictures, these are instrumentally removed, as far as possible, by means of scissors, knives and punch-forceps, and the lumen of the stenosis is made as nearly normal as one can make it, so that the biggest possible drain can be introduced into the narrowed part of the larynx.

It is best to use an india rubber drain slightly wider than the lumen, so that the drain may cause a certain pressure against the walls of the larynx. The laryngeal drain, which is about 5 cm. long, must be placed so that it extends outside the narrowed part of the windpipe.

The lips of the wound are kept apart by means of retractors, and it is thus made easy to introduce the drain through the fissure. The upper end of the drain must not protrude into the superior aditus of the larynx, because, in this case, particles of food can get into the trachea and cause irritation, coughing and, eventually, infection of the air passages.

After the tube is in place, the position of its upper end must be determined either by introducing the exploring finger through the mouth or by means of suspension laryngoscopy. If the upper end protrudes into the pharynx, one must correct the position of the drain and fix it in a lower position.

Fixation of the drain is performed translaryngeally by means of a long, curved perineal needle, which is passed from side to side through the soft parts of the neck, the thyroid cartilage, the mucous membrane and the drain; and by means of the needle, a silver wire of medium thickness is drawn back through the throat. In this manner, the drain can be firmly fixed in the stenosis and will do its work of dilation for months without inconvenience to the patient. The ends of the wire are cut off as close to the skin as possible. The external wound can either be closed with a few stitches, or left to itself—it heals in the course of a few days. Figures

69, 70 and 71 show how the india rubber tube is placed in the larynx.

In children, the tracheal cannula is left in position, even if introduction of the drain gives good results with regard to respiration. It often happens in cases of children with small lumina of the larynx that the tube is obstructed, thereby causing suffocation; in that case, the tracheal cannula has to be reintroduced at once. Such

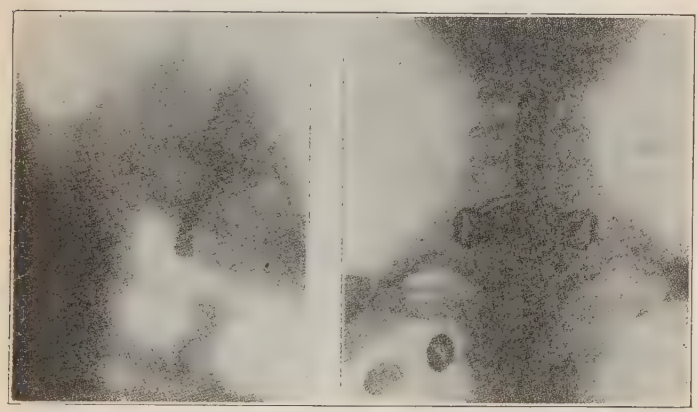


Fig. 69—Left: Side view of the india rubber tube and the cannula.

Fig. 70—Right: Frontal view of the india rubber tube and the cannula.

dangerous attacks can be prevented by letting the cannula remain in the trachea.

The great advantage of this treatment is that it causes the patient so little inconvenience, if the drain is put in the right place. The frequent, often daily, exchange which was necessary in all methods founded on the introduction of bolts either from the mouth or from below, is completely avoided. The drain once placed in position can remain there for weeks and months without causing any reaction. The patient can be sent home to come back later in order to have the tube changed or removed. If the tube has to be changed this is, of course,

performed by means of a laryngotomy or a tracheotomy; but this is done in children under general anesthesia or in adults under local anesthesia.

This exchange may be necessary in cases in which the upper end of the tube protrudes above the superior aditus laryngis, so that the patient cannot drink without the fluid running down into the windpipe and being

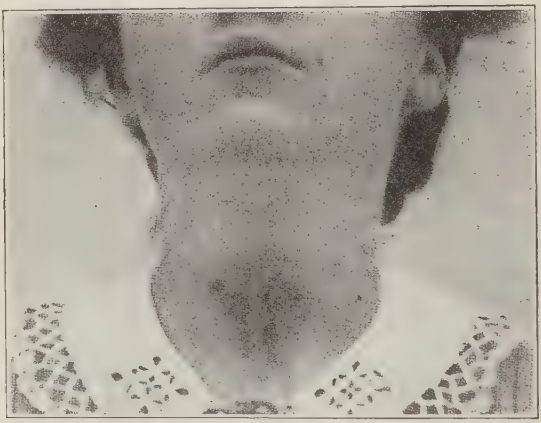


Fig. 71—Patient with healed tracheal fistula, carrying in her laryngeal stenosis an india rubber tube translaryngeally fixed by silver wire.

coughed out through the tracheal cannula. In this case, one must open the wound, remove the wire, move the drain a little farther down toward the trachea and transfix it in its new position.

To avoid this inconvenience one ought always, either by exploring with the finger through the mouth or by examination in suspension laryngoscopy, make certain that the upper end of the tube is in correct position in relation to the upper entrance of the larynx and only then close the wound in the larynx.

Another advantage of this treatment is its comparatively short duration.

With the exception of three unusually serious cases

of laryngeal stenosis, in which the drain had to remain in position six months, nine months and eleven months, the dilations took only from one to ten weeks, as follows: one patient cured after one week; one after three weeks; three after four weeks; one after five weeks; two after six weeks; three after seven weeks; one after eight weeks; one after nine weeks, and two after ten weeks.

The average time of treatment for these fifteen patients was about six weeks, and in most of the cases the author had to do with solid stenoses, some of them with complete diaphragmatic synechias of the laryngeal and tracheal walls.

Often the treatment may be considered finished when, after laryngofissure, the drain is fixed in its proper position and the causes of the stenosis have been removed by operation. A few days after the operation, the external wound is healed, the wire that fixes the tube is concealed under the skin, swallowing is easy and natural, and the patient can move about with his cannula as a safeguard against respiratory difficulties, or, in the case of an adult, without it; for in the latter, the tube—which is of the size of a finger (filière nos. 33 to 40)—is so wide that there is always free respiration through the tube.

The author often finds that the stenosis, on removal of the tube after two weeks or a month, has been sufficiently dilated, so that the drain can be removed and the tracheal fistula closed.

Sometimes the passage through the larynx has not become sufficiently free, and the operation has to be repeated and a drain larger than the one used after the first operation introduced. With just a few exceptions, this treatment has been successful, the drain having been left in position for a month or so. Should this second operation not be quite satisfactory it must be repeated, the size of the tube being increased each time. In this manner, the author succeeded in entirely curing a patient with a severe syphilitic perichondritic stenosis, but

the operation had to be repeated five times and the size of tube increased from filière no. 20 to no. 39.

This method necessitates a certain amount of surgical skill, especially with regard to placing the tube in the right position. These difficulties, however, are lessened after one has tried the operation a few times, and the author is confident that any one who has had the opportunity to use this method will come to the conclusion that there is no method which so surely, quickly and safely will produce cure of even the severest cases of laryngeal and tracheal stenosis as the one presented.

Postdiphtheritic Stenosis of Cicatrices of the Larynx in Children and Their Treatment. The postdiphtheritic cicatricial stenosis of the larynx is caused by (1) diphtheria, (2) tracheotomy and (3) intubation. The pseudomembranes in the region of the cricoid cartilage cause grave stenoses not only in the acute stage but also later, whereas the accumulated layers around the glottis scarcely cause later disturbances, but they cause attacks of suffocation in the acute stage. In the region of the cricoid cartilage, the opening is smaller; the submucosa is richer and more loose, containing many lymph vessels, and it is especially adapted to deep infiltration. When the pseudomembranes are detached, an ulcer remains, which is covered with epithelium. In deep ulcers, vivid granulation occurs which heals slowly. In the region of the cricoid cartilage, a scar results which forms at times a crest, frequently a circular cicatrix and rarely an irregular scar; then again, a thick, callous cicatrix with a broad base, which causes a pronounced stenosis and sometimes a total occlusion. While a correct tracheotomy may cause a stenosis, a badly performed tracheotomy, the cricotracheotomy, can more frequently be accused of causing trouble. Intubation can cause decubital ulcers. They can be found where the tube exercises pressure: at the base of the epiglottis, at the arytenoid cartilage and in the region of the cricoid cartilage. The first named ulcers can exist without causing further injury, whereas

the ulcers in the region of the cricoid cartilage increase the disturbance. Yet superficial ulcers may heal in spite of intubation. A grave stenosis may even be prevented by intubation. M. Paunz[9] reports a case in point. In deep ulcers, the continued use of the tube is injurious, even sometimes if the brass healing tubes of O'Dwyer, (coated with gelatin and Ermold's tubes impregnated with alum powder) are used. In these instances, a secondary tracheotomy is required. After the tracheotomy, intubation should be continued, according to O'Dwyer and Bokay, but as a systematic method of dilatation. It is possible that highly concentrated serums may be the cause of less frequent instances of stenosis.

The author now uses Hasslinger's directoscope for diagnostic purposes in children, because it is more perfect and more easily handled than other instruments. Probing is most important. Laryngofissure is the only procedure that allows a good inspection. It is imperative that this method should not be resorted to, however, in cases in which the process of scar formation has not come to a standstill. It is also inadvisable to perform laryngofissure in children under 4 years of age. Treatment consists of (1) creation of a satisfactory opening, and (2) closure of the fistula in the larynx or trachea.

The author treated nineteen patients with cicatricial stenosis following diphtheria, from 1917 to 1928. Two patients came from other hospitals and eight from the province. In all, sixteen carried cannulas for three months, and for two, three, five, seven and eleven years. Nine patients were treated by laryngofissure with excision of the scar and immediate closure of the larynx. Of these, two were treated by systematic intubation; the other seven with gauze tampons treated with iodoform, and later with rubber drainage tubes or solid rubber and metal plugs. The time of treatment was from two or three months to one year, in one case two years. In all cases, a complete cure resulted. The fistula in the trachea

(9) Ztschr. f. Hals- Nasen- u. Ohrenh., Jan. 7, 1929.

closed spontaneously in the two patients treated by intubation and in one treated with a rubber drainage tube. In five patients, closure was obtained by the suture in two layers. In a boy, aged 3½ years, the fistula was not treated. It forms a slit 1 mm. wide and 8 mm. long. The boy, now aged 12 years, can breathe freely and speak with a loud voice. In seven cases, the stenoses were grave. Among them were three cases of total occlusion. In three patients (among them two with impermeable cicatricial diaphragm), a complete cure was obtained with subsequent plastic closure of the laryngostoma (twice with implantation of a periosteum bone plate from the tibia, and once with the two layer suture). Two patients are still under treatment. In two cases (in 1921 and 1922), treatment could not be completed for other reasons. The author reports three other cases in which the patients had been admitted without a previous tracheotomy. Of the sixteen patients who carried cannulas, twelve could abandon them entirely. The children developed well. One child died of tuberculous meningitis after the cannula was no longer in use and after the tracheal fistula was closed. The other children did not carry a cannula for from three to nine years. Most of them have a rather good and some even a perfect, voice.

Tracheobronchial Stenosis of Tertiary Syphilitic Origin: An Unusual Disease. An unmarried woman, aged 26, noted loss of weight for six months, and some cough with slight pain. For a month previous to observation she had paroxysms of dyspnea which she attributed to asthma and which were not serious enough for her to consult a physician. A week before entrance to the hospital she had a troublesome cough. The day previous to entrance she became so dyspneic that she lost consciousness; a physician was summoned, who gave her two injections. The following day she came under the observation of E. Gjertz and C. W. Lundquist[1]. On

(1) Acta Oto-laryng., 13: 126, 1928.

examination she was pale and emaciated, and seemed to experience great difficulty in respiration. The temperature was 38 C. (100.4 F.), and the pulse rate 148. The heart was not hypertrophied. The sounds were muffled but could be heard. The lungs were hyper-resonant except at the base. The liver was palpable, but the spleen was not. The axillary, cervical and inguinal glands were palpable. There was a scar in the left inguinal region. The urine showed hyaline casts and leukocytes. The sputum, while thick and tenacious, showed nothing noteworthy. The reflexes and pupils were normal. On entrance treatment with epinephrin, atropin, camphor and a digitalis preparation were tried in turn without success. The second day an *x*-ray picture showed an irregular shadow above the arch of the aorta but not involving the aorta. The patient died in the afternoon of the second day. A Wassermann test was not made. The autopsy revealed a cicatricial stenosis of the trachea about 4 cm. above the bifurcation. There was a thickening and swelling of the membranes; the liver showed an area of circumscribed atrophy. Microscopic examination showed perichondritis with endarteritis obliterans. The same vascular changes were found in the liver. The paratracheal glands showed caseous necrosis.

In discussing tertiary tracheal syphilis, the authors describe three types: (1) gummatous infiltration with ulceration; (2) circumscribed gumma of the tumor type, and (3) cicatricial stenosis.

The most frequent of these is the cicatricial type, involving the lower segment of the trachea, accompanied often by pulmonary syphilis in the form of syphilitic tumors or syphilitic sclerosis of the lung tissue. The process begins in the mucosa or submucosa, or, according to some authorities, as a perichondritis. This is followed by infiltration and, later, necrosis. These ulcerations may involve the trachea, the esophagus and even the large vessels of the thorax. The process may involve bronchi of the second and third order. Even the medi-

astinal glands may be invaded. The necrosis is followed by cicatrization and, finally, stenosis. The neighborhood of the bifurcation seems to be the most favorable site, because it apparently is the point of least resistance.

Tertiary tracheal syphilis is most frequently associated with syphilis of the liver.

The authors give the following differential classifications: (1) stenosis following diphtheria and typhoid fever and congenital malformations which are not complicated by cicatrices and ulcerations; (2) constrictions following glanders, leprosy and rhinoscleroma; (3) strictures of tuberculosis, and (4) neoplasms and malignant conditions.

Microscopically, only tuberculosis and syphilis present any great question of differentiation. The former is rarely found in the trachea and, when present, the ulcers rarely produce stenosis. To detect the bacilli or the spirochete in the specimen is difficult and not so satisfactory. Injection in animals may prove disappointing. Evidence of the disease noted in some other viscera, is perhaps, more conclusive.

The following observations were made in the authors' case: The microscopic specimen showed the characteristics of syphilis. Hepatic syphilis was present both macroscopically and microscopically. There were no tuberculous foci.

Tuberculous bacilli could not be found. However, an injection was not made into an animal.

The authors' discussion of their case is as follows:

The past history led first to the belief that the patient was suffering from an asthmatic paroxysm, and she was treated accordingly without success. A foreign body in the air passages was considered. The voice was normal; vesicular râles were heard more on the right than on the left side. On account of the emaciation, the presence of a malignant condition was thought possible, and the *x*-ray picture substantiated this belief. Aneurysm of the aorta was ruled out by the *x*-ray picture. Benign

mediastinitis was a possibility. However, on account of her almost sudden death, little could be done clinically. In spite of the absence of the Wassermann reaction, the autopsy showed enough evidence of syphilis both macroscopically and microscopically.

Laryngeal Stridor and Dyspnea in Childhood. Under the heading of nervous disorders, E. C. Yates[2] mentions laryngitis stridulosa, laryngismus stridulus, tetany and the thymo-lymphatic child. The author's second group consists of extrinsic causes: enlarged glands, retropharyngeal abscess, injuries, foreign bodies outside the larynx but causing pressure, edema of the glottis, nephritis, etc. The third and last group consists of intrinsic causes; congenital stridor (causing dyspnea due to folding of epiglottis and narrowing of vestibule), new growth (usually papilloma), stenosis (following scars from burns, caustics and infectious diseases), foreign bodies and acute inflammation (especially in acute infectious diseases and streptococcus and mixed infections).

In conclusion the author states that laryngologists are frequently called to see such a child in "extremis" and it becomes necessary to do an intubation or tracheotomy to relieve immediate symptoms and the diagnosis is made by smear and culture afterward. The latter cases are very severe and the mortality is high. It behooves one to examine the larynx in children if necessary with the aid of a laryngoscope.

Upper Respiratory Therapy in Persistent Hiccough. In reporting two illustrative cases V. K. Hart and J. P. Matheson[3] present their technic for this troublesome condition. The throat is sprayed with a 2 per cent cocain solution. One application of 20 per cent cocain is then made to the larynx by indirect laryngoscopy. Again by indirect laryngoscopy, about 1 c.c. of 4 per cent cocain in a laryngeal syringe is instilled drop by drop

(2) Kentucky M. J., September, 1928.
(3) Laryngoscope, September, 1929.

between the cords into the trachea. By the same method, warm oil (plain albolene), is then slowly dropped into the larynx and trachea.

Demonstration of Intratracheal Anesthesia and a New Method of Resuscitation. P. J. Flagg[4] has built up a tube consisting of a piece of bronchoscope. There are three sizes, 5, 7 and 9, corresponding with the typical Jackson bronchoscope. This piece of bronchoscope has been continued by a tightly-woven wire spring covered with rubber drainage tube, resulting in a tube which is both rigid and flexible in those positions requiring these possibilities most. The tube is intubated under direct inspection, and from the time of intubation there is practically no trouble with the patient. There is no postoperative aphonia or unpleasant effects from the use of the tube. The author is using this as a routine for all operations about the head and neck.

The author believes that for resuscitation the three principles of inspection, aspiration and insufflation should be kept in mind. For inspection he has devised a pocket flashlight laryngoscope. The instrument consists of a battery handle upon which is a demountable laryngoscope, provided in three sizes. Each laryngoscope contains a large lateral channel for the removal of intubation tubes, a large lamp situated as near the tip as possible; the whole a sterilizable unit which can be boiled, providing electric connections which are free from loose wiring. This equipment may be counted upon to function when needed. The author has carried around one of these laryngoscopes in a handbag without protection, and has used only two or three lamps in the course of a year of almost continuous use. One has, therefore, a means of inspecting the field under conditions where resuscitation is required; namely, in asphyxia and under complete anesthesia. Any man, properly instructed, can promptly laryngoscope a patient under these conditions. Fortunately, where a

(4) Laryngoscope, September, 1929.

patient needs resuscitation most, we have the easiest possible conditions for laryngoscopy.

For aspiration the author uses a four ounce bottle with a suction bulb and a special curved tip, which will empty a child's airway in three or four sucks.

In order to bring about the insufflation which is required, provided a field which is perfectly free, all that is required is some sort of tube to pass between the vocal cords into the trachea, some sort of apparatus to give oxygen under pressure, and lastly, some means of controlling the pressure delivered. The pressure required for an adult will vary from 30 to 50 m.m. of mercury. In a new-born baby, the lung will expand and by auscultation one may hear air going into the axillary spaces with 15 m.m. of pressure. The writer first used an oxygen tank, such as one finds standing on the operating floor. He found that this low pressure tank was usually empty. A small high pressure tank, necessitating a reducing valve was then used. Some sort of holder was also necessary for the manometer, and it was found convenient to fasten this to a reducing valve. The apparatus is therefore relatively very simple. The container serves not only as a holder for the gas and manometer, but as a table as well.

For adult treatment the author has utilized the ordinary bronchoscopic tube, shortened to such a length that it will not touch the corina. In the new-born baby, he uses a very small tube—4 m.m. While this tube appears large and almost threatens to traumatize a newborn baby, it will easily slip into the glottis of an unconscious or asphyxiated baby, with plenty of room to spare.

Is the Treatment of Speech Disorders a Medical Problem? J. A. Glassburg[5] believes that the treatment of speech disorders is a medical problem which requires the cooperation of the pedagogue, the psychiatrist

(5) J. A. M. A., March 23, 1929.

and the rhinolaryngologist. Teachers should work under the supervision of a medical director.

Speech disorders may be classified under two headings: stuttering and stammering, which are synonymous, and defective phonation.

Stuttering or stammering is a spastic coordination neurosis based on a mental conflict. The causes are predisposing, exciting and aggravating. The predisposing causes are heredity and neuropathic constitution. The exciting causes are nervous shock and psychic insult. The aggravating causes are pathologic conditions in the mouth, ear, nose and throat. The treatment of stuttering is medical, surgical, psychotherapeutic and reeducational.

Aphasia, adenoids, abnormalities of the uvula, intranasal obstructions, tongue tie, cleft palate and harelip, and deformities of the jaws and dental arches are all causes of defective phonation which require the services of the oral surgeon, rhinolaryngologist, neurologist and dentist before the teacher attempts reeducational methods. In every case of defective phonation a thorough physical examination should be made before corrective measures are instituted.

Hoarseness, falsetto voice, retarded speech development, perverted speech, the speech conflict, lisping and nasality are forms of speech disorders based on physical or mental causes which require the attention of the medical specialist in order to overcome the disorder.

The Speech in Medicine. According to W. B. Swift[6] medical men, whatever their general work or specialty in medicine, should add to their armamentarium any new avenue of examination; and especially an avenue which contains so many pathognomonic signs as does the avenue of speech. Not only have signs of speech change long existed in the literature of medicine, such as aphonia, aphasia, syllable elision, scanning speech and plateau speech, but recently pathognomonic signs

(6) M. J. & Record, Aug. 21, 1929.

have also appeared diagnostic of tabes, chorea, progressive muscular atrophy, feeblemindedness, and athetosis; and there have been discovered pathognomonic signs of all the psychoses except dementia precox. In addition to these, paresis has a new sign. There is a pathognomonic signs of superior mentality, and probably for genius. Amyotonia exquisita and myasthenia gravis also show pathognomonic speech involvement. Deafness, dysarthria, cleft palate, stammering and lisping also fall in line with definitely describable speech signs. This array of signs makes the speech in medicine a new and valuable avenue for pathognomonic diagnostic signs in nervous, psychotic, and somatic disease.

Rhinolalia Aperta. While considering the small per cent of children developing speech imperfections compared to the number of tonsil and adenoid operations performed, nevertheless D. L. Poe[7] believes the total aggregate of such cases is fairly large and of importance. He cites several examples occurring in the practice of qualified laryngologists and producing considerable embarrassment because of the persistence of the speech defect.

The unnatural nasaling of speech is practically entirely due to a lack of physiological function of the soft palate. In uttering words, which do not possess a nasal character, the soft palate normally shuts off the naso from the oropharynx in such manner that the greatest amount of the vibrating current escapes from the mouth and only a minimum of air comes into relation with the nasal chambers. If, however, the soft palate hangs loosely at a time when it should be tautly stretched to the posterior pharyngeal wall, the nasopharynx communicates with the oropharynx, and vocal air blasts, which should escape by way of the mouth only, enter more freely into the nasal cavities. The sound which normally should be metallic is now abnormally nasal.

(7) Laryngoscope, December, 1928.

Since lack of physiologic function of the soft palate is the cause of the unpleasant nasaling, the remedy lies in bringing back a normal action of the organ. It is very difficult, indeed, to say which method is the best to bring about the desired results. It is safer to say that it is a combination of methods or procedures which finally brings about a complete correction. The first in order of the remedial agencies is massage of the soft palate. This can best be done with the tip of the finger while the member hangs loosely, or while it is somewhat innervated, especially when the patient is uttering the "ah" vowel.

Electric current to the soft palate can also be used. Some authorities massage the organ with instruments.

In a study of the physiology of the pharynx when sound is forcibly produced, the musculature is seen to contract and a prominence, known as the Passavant prominence, is formed. This swelling decreases the pharyngeal lumen and assists the soft palate in shutting off the oro from the nasopharynx. In some people this projection is prominently developed, while in others it is rather rudimentary. The musculature forming this Passavant prominence is intimately connected with that of the larynx below and the palate above. When the muscles of the pharynx are energetically set into motion the soft palate is also drawn into action. One of the easiest methods by which the pharyngeal musculature can be set into activity without the use of instruments is to utter an energetic tone; *i. e.*, the tone should be attacked vigorously, loud and in a pitch higher than the person's normal conversational voice. By this method the muscles of the larynx are strongly set into play, the activity is communicated to the pharynx and from thence to the soft palate.

Most frequently patients, especially children, finding it painful to talk shortly after a tonsillectomy, attempt to spare themselves as much suffering as possible. They either do not talk at all or when they do speak

they do so with the least amount of exertion. They soon learn that allowing their soft palate to hang loosely without any contraction while speaking gives the least amount of pain. In addition the soft tissues about the tonsillar beds may also be very edematous and for that reason almost immovable. Speaking without innervating the soft palate, if frequently repeated, soon becomes a habit. In due time the individual may even forget how to properly innervate the member as an accompaniment to normal speech, especially if the person be neurasthenic.

In the early stages of nasaling, *i. e.*, in attempting to speak very soon after a tonsillectomy is performed, speech is accompanied with a pronounced nasal complement; usually a change in the manner of delivery is sufficient to correct the imperfection. For instance: The patient utters a sentence or phrase quietly, slurring over the words, imperfectly enunciated. Having the individual pronounce the words with some gusto, the nasaling will frequently disappear.

Diseases of the Bronchi

Asthma

The Rhinological Problem in Asthma. B. Haseltine[8] emphasizes the importance of the "ethmoid region" in these cases. He notes the unsatisfactory results following many surgical procedures on the nose. The treatment advocated by the author is essentially the Dowling tampon treatment. The method utilizes the principle of osmosis. The tampon is simply the application to the mucous surface of a cotton pad saturated in a colloidal silver solution and allowing this to remain until the solution is taken up by the tissues, this being from forty to eighty minutes. Experiment shows that the solution is distributed by the circulation far beyond the area of its application. An aqueous solution of argyrol in a

(8) Illinois M. J., December, 1928.

strength of about 10 per cent is advised. The mucous surface must, of course, be clean and it is desirable to cover with the cotton pads every available bit of the intranasal mucosa except the floor. No cocain nor adrenalin should be employed, since these greatly lessen the effect of the treatment. It is important to reach the posterior and upper nasal spaces and as far in the infundibular direction as possible without trauma. The clumsy stuffing of cotton wads into the anterior nose, so often called Dowling treatment, is nothing but a travesty.

The niceties of technic are highly important. The author's own practice differs slightly from that of Dowling. Instead of a single large tampon, he uses a variable number of thin and delicate wisps of long fiber cotton. This is especially important in asthma cases because the "asthmo-genetic zone" often cannot be reached by a large tampon. These delicate pads are successively applied with a slender, polished, tapering applicator in sufficient number to cover the nasal mucosa all the way from the nasopharyngeal vault and the cribriform plate around the under surface of the ethmoid turbinal and upward upon its outer surface to a considerable extent. After swelling is reduced by a few treatments, the turbinal can be almost entirely enveloped by the tampons. It is desirable that the cotton be easily released from the applicator and left at the farthest point reached without crowding or friction. The economical nose specialist who uses rough, rusty, or crooked applicators often unwittingly does an intranasal massage that leaves his patient in worse condition than before.

Besides the therapeutic use of the tampon, it has an important diagnostic value. This is change in color (blanching) which the solution undergoes in the presence of infection. This change is unmistakable and positively indicates infection even in the absence of other signs. In obscure or doubtful cases a succession of six to ten "diagnostic treatments" should be given

after which the blanched tampon or even the appearance of pus or small polyps in the deep recesses will often remove all doubt.

The value of this procedure in treating nasal infections has naturally brought it into prominence in connection with the asthma work. Many rhinologists, supposing it to be new, have raised the question of the possible danger of argyria. Articles on argyria have been carefully searched and nothing has been found suggesting argyria from this procedure.

It is emphatically not a method for self treatment and the solutions should not be given to the patient. This is one serious objection to the use of a trade name. It is neither necessary nor wise to use strong solutions. Those who employ 50 per cent solutions betray lack of experience with the method and perhaps take some risk. It is probably unwise to use it upon areas denuded of mucosa. Observing these precautions, the rhinologist may use the method for any length of time with no apprehension and it will materially contribute to his success.

[The relation between nasal conditions and asthma can often be expressed in the term "hyperplastic ethmoiditis." The cure of asthma, which is definitely the result of intranasal manipulations, for the most part depends upon the removal of nasal polyps and the exenteration of the ethmoid.—Ed.]

Studies in Asthma: (IV) The Nose and Throat in Asthma. The present report by F. M. Rackemann and H. G. Tobey[9] is based on a study of 1,074 patients with asthma. The authors have found that:

1. Twenty-eight per cent of the patients with asthma gave a history of previous operations on the nose and throat without regard to the cause of asthma as found.

2. Examination showed a true focus of infection in the nose, throat and teeth in 44 per cent of all cases, while vasomotor rhinitis occurred in 14 per cent. There

(9) Arch. Otolaryng., June, 1929.

were more patients with a focus in the intrinsic than in the extrinsic group, as expected.

3. The presence of foci bears little relation to the outcome of the asthma.

4. The gross results of treatment are disappointing, as shown by the comparison of patients with foci in each group on whom operations were and were not performed, and by analysis of the different lesions treated.

5. Local treatment of the nose, throat and teeth has apparently brought about permanent relief from asthma in 5 per cent of the cases.

6. It is suggested that local lesions of the nose and throat may develop from the same fundamental cause as the asthma itself and be part of the pathologic process of the disease.

An Unappreciated Cause of Chronic Bronchitis. A. Oschner[1] states that following the bronchographic examination of a large number of patients suffering from so-called chronic bronchitis, evidence of bronchial dilatation was found in more than 90 per cent of the cases. Cases of chronic bronchitis lasting over a period of months or recurrent attacks of acute bronchitis should be given the advantage of a bronchography.

The introduction of iodized oil into the tracheobronchial tree is of distinct therapeutic value not only in those cases of chronic bronchitis and recurrent attacks of acute bronchitis but also in the cases of definite bronchiectasis with large amounts of foul sputum.

The method used for introducing the iodized oil into the tracheobronchial tree should be simple; it should not require a great deal of technical skill; it should be easy to carry out, harmless and not unpleasant for the patient. This is best accomplished by the passive technic.

The technic of the procedure, as carried out clinically, may be thus briefly described: Following the use of an antiseptic mouth wash, the anterior surface of the anterior tonsillar pillars is painted with a 10 per cent cocain

(1) J. A. M. A., July 20, 1929.

solution. The anesthesia is continued until the swallowing reflex is abolished, as evidenced by immobility of the larynx on attempted deglutition. As soon as the anesthesia is complete, the patient is instructed to take about 3 c.c. of a 3 per cent procain hydrochlorid solution into his mouth. He then tips his head backward, protrudes his tongue, so that the procain solution may enter the pharynx, leans slightly to the side which one desires to fill, and breathes. The procain solution is used as an anesthetic to the tracheobronchial mucosa. As the anesthesia of the anterior pillar is only temporary, it is essential again to paint the anterior pillars with a 10 per cent cocain solution. The patient is then placed behind the fluoroscopic screen and given 10 c.c. of iodized oil and instructed to assume the same position that he assumed while inspiring the procain solution. The entrance of the oil into the trachea and bronchi is observed fluoroscopically. The oil can easily be seen entering the trachea and bronchi, and will show any deviation from normal in the shape, contour and direction of the bronchi. The patient expectorates the saliva that has collected in the mouth, following which he aspirates another 10 c.c. of iodized oil.

There are two points that must be emphasized in regard to the technic. First, the anesthesia obtained is only temporary, lasting not more than one or two minutes. For that reason it is absolutely necessary that as soon as anesthesia is obtained the patient be placed immediately behind the fluoroscopic screen and the oil introduced. Second, in order to minimize error in diagnosis, it is essential to observe the mode of filling of the bronchi with the oil fluoroscopically. If one depends on an interpretation of the roentgenogram following the introduction of the oil, mistaken diagnoses are sure to be made.

The passive technic is considered the ideal procedure to be used in bronchography. It is easy, simple, does not require any special instrumentation, and is neither

unpleasant nor harmful to the patient. Because of its simplicity and harmlessness, one would not hesitate in advocating its use in a case of chronic bronchitis or as a therapeutic measure. The author has employed this procedure in more than 1,500 instances without any bad results, and has never had a patient object to a refill when used therapeutically.

[The technic described by the author does not impress the laryngologist as it would seem much simpler to bring about the necessary anesthesia by direct application of the cocain to the larynx and trachea under the guidance of a laryngeal mirror. The introduction of the iodized oil into the trachea can be carried out with ease, without the extensive use of cocain described by the author.—Ed.]

Experimental Study of the Effects of Stimulation and Section of the Vagal Innervation to the Bronchi and Their Possible Relation to Asthma. The chief characteristic of asthma is the recurrence of paroxysmal attacks of respiratory dyspnea which last a variable length of time, frequently until the action of some drug affords relief. The suddenness of the onset and the course of the attack suggest, as the underlying mechanism, spasm of the bronchial musculature in response to some stimulus. It is fairly well established that the constrictor fibers to the bronchi travel by way of the vagi. It is also generally accepted that there are cases of reflex asthma. Accepting these two factors, and granting that bronchial spasm plays a large part in the production of the attack, one might assume that the stimuli that reach the lung and produce the asthmatic attack probably travel by way of the vagi.

The literature supports the theory of reflex asthma. Experimentally Carlson and Luckhardt showed contraction of the lung in the turtle resulting from rubbing of the posterior nares. Sluder reported a case in man in which an attack of asthma could be produced at will by the application of irritants to the sphenopalatine fora-

men. A great many cures of asthma have also been reported following correction of abnormal intranasal conditions. Abbott reported cases of ethmoiditis and asthma in which the asthma was relieved when the ethmoiditis improved and was made worse with the return of the ethmoiditis.

Much benefit has resulted from the study of the hypersensitive cases of asthma in relation to anaphylaxis. Coca pointed out, however, a difference between atopic manifestations (asthma and hay fever) and anaphylaxis, but stated that both antibody and atopic reagin may exist simultaneously. Much more remains to be learned about the way in which foreign-protein sensitization causes paroxysmal bronchial spasm. Two obvious mechanisms suggest themselves: one that the sensitized bronchiolar musculature, on coming in contact with antigen, fixes this very much like the sensitized uterine muscle fixes antigen in vitro; and another that the bronchiolar spasm is essentially a reflex by way of the vagi, the sensory stimulus to this reflex being a local reaction in some part of the body, where generalized hypersensitivity exists (so-called Arthus phenomenon).

The first hypothesis has been rather widely discussed in the literature, but the second has not been given the attention it seems to deserve. Cases of hay asthma, on the latter hypothesis, could quite possibly be the result of a vagal reflex, by way of the fifth nerve, ending in the eyes and nose. Slude reported a case of asthma which would be difficult to explain except on a reflex basis.

This study by H. T. R. Mount[2] was undertaken to determine whether a physiologic basis existed for a reflex mechanism in certain cases of asthma. An attempt was made to determine whether changes could be produced in the lungs of experimental animals by various methods of stimulation of the vagi, similar to those found in lungs of asthmatic patients.

If certain cases of asthma are due to stimuli reaching

(2) Am. J. M. Sc., May, 1929.

the lung by way of the vagi, relief should result from a method of treatment which would interrupt the pathway of these stimuli. Physiologic and histologic experimental observations were made by the author on dogs, guinea pigs and one monkey with regard to the symptoms and changes produced by various types of stimulation of the vagi in the neck. In many cases the resultant changes in the lungs (bronchial constriction, bronchorrhea, cellular infiltration, and emphysema) were similar to that seen in asthma. The studies thus establish a physiologic basis for the reflex nature of certain types of asthma.

The course of the fibers involved is presented and it was found that untoward symptoms did not result from their section in the dog. These experiments form the basis for the suggestion that in certain types of intractable asthma posterior mediastinotomy, with section of the bronchial branches of the vagi, using the extrapleural approach might be considered.

The Pathogenesis and Treatment of Asthma. The balance between the vagal and the sympathetic constituents of that part of the respiratory centre in the medulla, which together with the associated peripheral ganglia controls the bronchi, is perfectly adjusted in normal individuals. A. F. Hurst[3] believes that the asthma diathesis—the congenital and often inherited constitutional abnormality which is the one essential factor in the pathogenesis of asthma—is caused by a slight deviation from the average blood chemistry, which results in the vagal constituent of the bronchial nervous system being the predominant partner. In such individuals certain chemical, reflex and psychical stimuli, which have no effect on normal individuals, give rise to spasm of the bronchial muscles and hypersecretion of the bronchial mucous glands, together with congestion of the bronchi, which is the natural accompaniment of their excessive functional activity. Recent investigations have demonstrated that even in the intervals between attacks the

(3) Practitioner, July, 1929.

blood of asthmatics shows certain constant divergencies from the average normal.

A further biochemical factor depends upon the varying activities of the internally secreting organs. The effect of fatigue, as shown by the increased tendency to asthma towards the end of each day, each week, and each period of work without holiday, is best explained as the result of exhaustion of the suprarenal glands, whose deficient secretion helps the vagal constituent of the bronchial nervous system to gain the upper hand over the sympathetic constituent, the activity of which requires an adequate supply of adrenalin. In support of this theory the blood pressure of asthmatics is generally low, and Oriel has found that many of them have well-marked hypoglycemia and give a glucose tolerance curve indistinguishable from that found in Addison's disease. The unfavorable effect of menstruation on many female asthmatics must also depend upon some alteration in the normal balance of the internal secretions.

In recent years so much attention has been directed to the question of hypersensitiveness to proteins and other chemical substances in asthma that there has been a tendency to regard this as the one essential factor. The truth is, however, that an individual who is hypersensitive to one or more proteins only suffers from asthma if he has the constitutional tendency, and there is no doubt that many asthmatics are not hypersensitive at all, their attacks being caused by reflex and occasionally psychical stimuli. It is none the less of the greatest importance to give every asthmatic an exhaustive cross-examination with the object of discovering whether some or all of his attacks are due to his being hypersensitive to the proteins of one or more articles of food, an animal emanation, a pollen, house-dust, orris root face powder, or the toxins of some organism, which is present in the body owing to infection of the bronchi themselves, the tonsils, nasal sinuses, teeth, or even the appendix or gall-bladder. In some cases further information can be gained

by cutaneous tests, especially with food proteins in children, and with pollens at all ages, but the method has proved of far less practical value than was at one time expected.

The nose is the most important reflex source of asthma. Brodie and Dixon showed that in animals stimulation of an area on the septum produces bronchial spasm. In individuals with the asthma constitution irritation of the corresponding area gives rise to a similar reflex. When a man with a narrow airway lies down at night the passive congestion of the cavernous tissue of his turbinals may be sufficient to bring them into contact with the asthmogenic area on the nasal septum. The narrow airway may be congenital or result from a deflected septum or from chronic infection which leads to permanent congestion of the mucous membrane and the development of polyps. A distended stomach and a distended rectum both may produce reflex attacks of asthma quite independently of any form of alimentary toxemia, an evacuation of the stomach or rectum producing immediate relief long before a change could take place in the blood from diminished absorption of poisons.

The most common psychological factor in asthma is expectation. An individual, who has been accustomed to having attacks of asthma in certain places or under certain conditions, is exceedingly like to continue to do so when the original chemical or reflex cause has ceased to be operative. This is a result of auto-suggestion, but it must be remembered that no amount of suggestion can produce anything more than tachypnea, without any trace of over-activity of the bronchi, in anybody who has not the asthma diathesis.

In discussing the treatment of asthma one has to consider the underlying constitutional abnormality, the chemical, reflex and psychological factors which can initiate an attack, and the attack itself. It is clear that the only true cure of asthma would be to abolish the diathesis by bringing the biochemical constitution of the body

fluids to the normal level. Removal of exciting factors leads to diminution in the frequency of attacks, and complete success in this direction may lead to an apparent cure. But the condition is not really cured, as the diathesis remains, and at any time the individual may become sensitized to another protein, as, for example, after an attack of influenza or other infection involving the nose, throat or bronchi, or a new peripheral source of irritation may arise which leads reflexly to attacks, or some psychological disturbance may develop which results in a relapse.

Moreover, the effects of desensitization are only temporary, and avoidance of exciting causes, such as cats or pollens, even for long periods, does not diminish the tendency to asthma on re-exposure.

Treatment of the paroxysm is of great importance. The author commends Adam's diet treatment, although personally he has not seen as wonderful results as one would expect. Residence at an altitude of 4,000 feet or higher seems to prevent the various exciting causes from producing attacks. Children living at this altitude for several years may be permanently cured. Possibly there are favorable biochemical blood changes which take place at this altitude.

It is possible to look forward to the time when sufficient is known about the biochemical changes which constitute the asthmatic diathesis to make it possible to imitate the effect of high altitudes upon this by well-defined changes in the diet, aided perhaps by drugs which can correct deviations from the normal reaction of the body fluids and make good any deficiencies in their mineral or other constituents.

With regard to reflex exciting causes, it is necessary to emphasize the importance of avoiding distension of the stomach and the rectum. In the case of the nose there are three distinct factors to be dealt with. The first and most commen is chronic infection of the sinuses, especially the ethmoids, with secondary development of

polyps; this must be dealt with by the cure of the infection, which can generally be effected by packing with silver preparations and vaccination without more radical operations than the removal of the polyps. The second factor is obstruction of the nasal passage; it is essential to overcome this, as few asthmatics can permanently be relieved if they are mouth-breathers. Lastly, the asthmogenic area on the nasal septum should either be destroyed by cauterization, or rendered inoperative by so correcting the other factors present that the turbinates no longer come into contact with it, even when distension of their cavernous tissue occurs as a result of gravity on going to bed.

In the treatment of the asthmatic paroxysm the preponderating activity of the vagal nerve supply to the bronchi can be overcome by means of drugs, such as atropin, which paralyze the vagus, or by adrenalin which stimulates the broncho-dilator fibres of the sympathetic. The inhalation of fumes from powders containing stramonium or belladonna, which was formerly the universal method of treatment, had the grave disadvantage of causing chronic bronchitis by irritating the bronchial mucous membrane. This treatment should never be used, as the opposite method of restoring the balance by means of adrenalin has no such disadvantage and is also more promptly and more constantly effective. The patient should be taught to inject the adrenalin himself, as if he does this at the first sign that an attack is developing it will be aborted, and a single minim will often be sufficient, though five or more would have been required had he had to wait for a doctor or nurse to give the injection at the height of the attack. This small dose gives rise to none of the unpleasant symptoms often caused by larger doses, and as it does not even raise the blood pressure there is no danger of damaging the arteries. Its use has in many cases the further justification of making good a deficiency in the secretion of adrenalin, just as thyroid preparations do in myxedema.

The treatment also reproduces the way in which relief may on rare occasions occur under natural conditions. If an individual during a severe attack of asthma comes under the influence of sudden fear or anger, the two emotions which Cannon showed stimulate the secretion of adrenalin, the attack immediately ceases, the patient having had an "autogenous dose" of adrenalin. It is hoped that the time will come when asthma will be curable, but until that time the proper use of adrenalin will be most satisfactory.

Bronchoscopy and Esophagoscopy

The Value of Bronchoscopy in the Diagnosis and Treatment of Asthma. From their experience L. Daily and R. K. Daily[4] state that just what the mechanism is by which bronchoscopic aspiration gives relief, the degree of its permanency, and why relief is obtained in one case and not in another—are problems still to be solved by further study. Their limited experience would give any hypotheses they might set forth a purely speculative aspect. It is possible that long-standing asthma sets up local changes in the bronchial mucosa, and the aspiration of irritating secretions breaks up the etiology-complex which excites an attack. They have not touched at all on the etiology of asthma because with that phase the bronchoscopist has no concern. Bronchoscopic examination is not advised as a promiscuous procedure or as cure-all to be employed in every case of asthma. If the internist can determine a definite cause for a given case, such as infections of the upper respiratory tract or an allergy, and can relieve the case by treatment, bronchoscopy is not indicated. In those cases in which the etiology remains uncertain, or the case does not respond to what appears rational treatment, a diagnostic bronchoscopy may reveal hitherto unsuspected changes in the

(4) Laryngoscope, May, 1929.

bronchi, and aspiration of secretions may give the patient relief not otherwise obtained. In spite of the limited experience, the authors feel justified in concluding that in a persistent case of asthma, in which a physician has exhausted all the means at his command toward arriving at a correct diagnosis and giving the patient relief, bronchoscopic investigation is indicated.

Bronchoscopy as an Aid in the Diagnosis and Treatment of Asthma. From his experience G. Tucker[5] believes that direct examination of the tracheobronchial tree by bronchoscopy is a most important aid in the differential diagnosis of bronchial asthma. Foreign body is a possibility for exclusion, particularly in children. A foreign body lodged in the larynx, trachea, bronchi or esophagus may produce asthmatic symptoms. Only direct examination by bronchoscopy will eliminate the presence of organic disease of the larynx, trachea, and larger bronchi.

Bronchoscopic aspiration and local medication have been found a valuable aid in cases of asthma with an associated tracheobronchitis. The patients' interests will be served best by the cooperation of the internist, the roentgenologist, the rhinologist, and the bronchoscopist.

Syphilitic Bronchitis. A. Valerio** states that the lungs, pleura and bronchi are the seat of syphilis more frequently than is believed to be the case. In children the syphilitic lesions of these organs appear after the age of 6 years, and in adults they appear 15 or 20 days after the chancre develops. The bronchopulmonary syndromes of secondary syphilis reveal the presence of a diffuse bronchitis. In two of his cases the author obtained excellent results with mercury treatment. The bronchopulmonary syndrome of tertiary syhilis includes several conditions, among them pulmonary syphilis, of which the syphiloma is characteristic. The author observed four such syphilomas. The diagnosis was based

(5) Delaware State M. J., February, 1929
(**) Brasil-Medico, May 25, 1929.

on the history and symptoms of syphilis, the localization of the lesion (which regularly is at the central part or base of the lung), and the absence of tuberculosis. The tentative treatment with mercury is also of diagnostic value.

Intratracheal Administration of Drugs in Abscesses of Lungs. N. A. Tliashenko[6] reports on the good results of the treatment of abscesses of the lungs by intratracheal administration of polyvalent antivirus (Besredka) combined with a 5 per cent solution of guaiacol and eucalyptol in oil. In the four cases reported by him the fever disappeared rapidly, the amount of the expectoration decreased considerably, the fetid odor disappeared, and the patients left the hospital with a considerable amelioration of the general and local conditions, confirmed by roentgenologic examination.

Pathogenesis of Aspiratory Abscess of Lung. A study of the pathogenesis of pulmonary suppuration following tonsillectomy has convinced J. Harkavy[7] that the greater amount of evidence is in favor of aspiration as the mode of production of suppuration of the lung following operations on the upper respiratory tract. Three of twenty-seven dogs that received, through the bronchoscope, 0.5 c.c. of mixed cultures of bacteria recovered from the sputum of patients with abscesses of the lungs following tonsillectomy developed abscesses with cavities; one developed pulmonary suppuration and a fifth presented evidence of a healed suppurative process in the lower lobe of the left lung, or 14.8 per cent of pulmonary suppuration. If results obtained in dogs may be translated to the conditions occurring in man, it is suggested that following aspiration of infectious material from the upper respiratory tract, the course of events is as follows: (1) pneumonitis; (2) necrosis and cavity formation; (3) healing or persistence of the primary abscess with the formation of secondary bronchiectasis.

(6) Odessky M. J., No. 4, 1929.
(7) Arch. Intern. Med., June, 1929.

Chronic Bronchiectasis in Childhood, with Observations on Early Diagnosis. E. S. Thorpe, Jr.,[8] states that if all cases suspected of having suppurative bronchitis were bronchoscopically treated and not filled with worthless cough mixtures, bronchietasis would actually be a rarity. Between treatments the children should have postural drainage, breathing exercises, plenty of nourishing food, cod liver oil, fresh air and adequate heliotherapy. A comprehensive program utilizing these agents should be planned for every case and no other remedy seems to be of any use. In advanced cases vaccine therapy should certaintly be tried, using an autogenous vaccine prepared from the endoscopic drainage.

Massive Atelectasis of the Lung Following Bronchoscopy. This patient had been bronchoscoped numerous times previously for treatment of asthmatic attacks, and iodized oil injection had revealed a bronchiectatic condition. On this last bronchoscopy J. V. Cassidy[9] had aspirated the lung with the minimum of trauma and under local anesthesia. Forty-eight hours later symptoms of left-sided atelectasis developed, which was confirmed by *x*-ray. The condition persisted for several weeks, being followed by roentgen examination. Bronchoscopy two days after the last roentgenogram, showed that the lateral wall of the left bronchus, beginning about an inch below the carina, was flattened, while the medial wall showed its normal concavity. The lumen of the bronchus was filled with thick, tenacious mucus. The lip of the bronchoscope had to press the lateral bronchus wall away to enter the left bronchus. The right bronchus was patent and did not contain exudate.

During the period of atelectasis the asthma entirely disappeared and the cough was partially relieved. The patient was comfortable, aside from feeling tired. As the atelectasis cleared up, the symptoms returned. Future therapeutic collapse of the lung seems indicated.

(8) Am. J. M. Sc., June, 1929.
(9) Arch. Otolaryng., November, 1928.

by the relief of symptoms, cough and asthma, during the atelectasis.

Roentgen Observations on Safety-Pins as Foreign Bodies. W. F. Manges[1] emphasizes that the safety-pin must be accurately localized, and that with a technically perfect roentgenogram one can either make actual measurements of the shadow of the pin or, by putting other pins in contact with the shadow, select the one nearest the size of the shadow. The distribution of the parts of the pin can and should be made out.

The author believes that the bronchoscopist should study the films with the roentgenologist in order to appreciate these variations rather than depend on a mere description of the situation.

At times it is impossible to determine how the safety-pin has arrived at its destination. It is believed that many of the cases in which the spring end is upward are the result of the gurgitation from the stomach and reverse peristalsis in the esophagus. On the other hand, one cannot conceive how a large, widely open safety-pin, with the open end downward, could have its keeper in the bronchus of the right lower lobe and the pointed branch in the upper lobe. Fortunately, the solution of the problem in one such case did not have any direct bearing on the fortunes of the patient; it was a more or less fortunate situation for him because the removal was relatively simple as the spring, or the part which presented itself to the bronchoscopist, was uppermost.

The anatomy of the safety-pin varies somewhat as to the thickness of the wire, the size of the wings of the keeper, the size of the spring coil and, particularly, the size of the spring clamp. The real importance of being able to determine these points by means of roentgenograms is that it frequently enables one to select a duplicate and with it make experiments in manipulation before attempting the removal of the foreign body. One is usually able to determine from the roentgenogram

(1) Arch. Otolaryng., March, 1929.

whether or not the pin is defective. These are variations which may influence directly the method of removal. For instance, the bronchoscopist would not try to close a pin with a markedly bent or defective keeper or a markedly bent branch—two rather common defects. In one instance the author feels certain that the pin opened after it had been swallowed and in this way became a foreign body with the open end downward. The pointed branch was bent, and the extreme point was slightly defective. The extent of the spread is another important and also variable condition. The two branches may be in any relation, from parallel when closed to at a right angle with each other, and one beauty pin was even much more widely open or more nearly straight. There is no such thing as a true normal spread; however, one frequently resorts to the term "normal spread." One often marvels at the size of the pin and the extent of the spread which may be present.

There have been a few cases of multiple safety-pins. In one case, the pins were large, closed and linked together in the trachea.

In a few of the cases of long standing, it has been said that the pin was corroded and might easily break, but in this again one cannot be certain from the roentgenograms alone.

Roentgen examination is of importance in a specific way in bringing to light evidence of complications or injury to surrounding parts. More or less extensive swelling is frequently found in the deep cervical structures or in the periesophageal or pulmonary structures. Such complications are found in cases of recent occurrence rather than in cases of long standing, which is natural, because if the foreign body is not removed, the complications become fatal before the object remains for any great length of time. Puncture of the pharyngeal wall soon causes a retropharyngeal or peripharyngeal swelling that will give positive roentgenographic evidence. When the point penetrates the esophageal

wall, there soon develops a more or less extensive mediastinitis or even pulmonary infection, either one of which is readily recognizable. The bronchoscopist should know of such complications before operation, if possible. Many of Jackson's cases are not primary when they come to him, and it is always difficult to determine how much injury has been done by previous instrumentation.

In cases of long standing, the safety-pin is usually in the bronchus, and the pathologic process in the lung around it is more or less extensive; information concerning this should be as exact as possible before operation.

Ulceration of the Esophagus. J. Friedenwald, M. Feldman and W. F. Zinn[2] have found experimentally on animals that ulcers of the esophagus produced by removal of a small section of the wall through the esophagoscope will heal readily within a week. Ulcers when treated with a 10 per cent solution of hydrochloric acid will become chronic, and healing will be markedly retarded. Perforation is a frequent occurrence when deep penetrating ulcers are treated with acid.

Ulcers when uncomplicated do not form strictures but heal rapidly. The *x*-ray examination reveals defects and spasm in most instances, which are characteristic of ulceration. Large penetrating ulcers may simulate diverticula. The ulcer is clearly demonstrated on esophagoscopic examination.

Peptic Ulcer of the Esophagus. According to J. Friedenwald, M. Feldman, and W. F. Zinn[3], although peptic ulcers of the esophagus are rare, they occur sufficiently often to be of clinical interest. They are usually observed in the lower third of the esophagus though occasionally they are located higher. These ulcers vary greatly in size and are usually single; the right posterolateral wall being most frequently involved. They resemble in many respects ulcers of the stomach and duodenum. Perforations are not uncommon. In large

(2) Arch Intern. Med., October, 1928.
(3) Am. J. M. Sc., January, 1929.

ulcerations, contraction takes place with the formation of stenosis and dilatation. In the small superficial ulcerations, healing is usual and the esophageal lesion is apt to be overlooked. The etiology of peptic ulcer of the esophagus is in every respect similar to that of the stomach and duodenum. In order that this affection may occur, it is necessary that the cardia remain patent so that the regurgitated acid gastric secretion may continue its corrosive effect upon the diseased area in the mucous membrane of the esophagus.

Ulcerations of the esophagus have been most frequently observed in adults more commonly between the thirtieth and seventieth years and are found equally divided between males and females.

The most prominent symptoms of the disease are pain, dysphagia, vomiting, hemorrhage and perforation. There is often great difficulty in arriving at a diagnosis; however, this may be greatly aided by means of fluoroscopy and esophagoscopy. The treatment consists in the eradication of foci of infection, rest, the regulation of the diet and the administration of olive oil, alkalis and belladonna and at times by the direct application to the diseased area of various remedies such as a solution of nitrate of silver through the esophagoscope. If healing does not occur following this plan of treatment, gastrostomy should be performed to insure adequate feeding and the esophagus kept at rest for a considerable period of time.

Peptic Ulcer of the Esophagus. From a study of 88 cases of peptic ulcer of the esophagus C. Jackson[4] believes that focal infection is the chief etiologic factor, with the tonsil as the most frequent site of the focus. Islands of gastric mucosa are accessory causes. Retrograde flow of gastric juice may or may not be a perpetuating etiologic factor, but it is certainly a cause of the pain.

The most characteristic symptom of peptic ulcer of

(4) J. A. M. A., Feb. 2, 1929.

the esophagus is retrosternal pain or discomfort extending through to the back. Chronic esophagitis is accompanied by the same symptoms, but of less severity. Ulcer may be symptomless.

The diagnosis of the peptic ulcer can be certainly made only with the esophagoscope. Esophagoscopy for diagnosis is indicated in every patient complaining of the slightest abnormality in swallowing or the slightest degree of retrosternal pain or discomfort.

The best treatment of peptic ulcer is by eradication of focal infection, plus the local esophagoscopic application of argentic nitrate, or bismuth subnitrate. Palliative control of the symptom, pain or discomfort is afforded by alkalis, especially sodium bicarbonate. Opiates are unnecessary and are contraindicated.

Perforation of the Esophagus With Report of Six Cases. Of these six cases reported by E. King[5] one followed bouginage of a lye stricture, four subsequent to ingestion of chicken bone, and one after swallowing a tack. Recovery followed in all but one case, that following ingestion of chicken bone. In two of the cases the perforation occurred in the thoracic and four in the cervical region.

In speaking of the indications for external surgery, pain is generally the first symptom. Fever, rapid pulse and difficulty in swallowing rapidly ensue. Swelling of the tissues and emphysema are also accompanying signs. The emphysema may be present in a slight degree and remain unrecognized unless the *x*-ray is employed, as explained by Iglauer in 1924. The *x*-ray is an important adjunct for determining the amount of swelling and the progress of the case. With these signs present, and, in addition, a high white count, there is every reason for opening the neck. Of course, each case is a problem in itself, and no set rules should guide the surgeon in handling it. Marsèke remarks that it is safer to operate too often than to withhold operation.

(5) Ann. Otol. Rhin. & Laryngol., June, 1929.

The infection first establishes itself in the loose perioesophageal tissues, and from there spreads out into the fascial planes of the neck, descending between the sheaths into the mediastinum. It is a relatively simple matter in upper esophageal perforations to open the neck and drain this area. It is not essential to remove the foreign body through the incision but it is essential to provide drainage. If the foreign body is found outside the esophagus, as in the case reported by Iglauer and Ransohoff, it can be removed. The author believes that Marschik's method is a very effective one for establishing drainage and preventing the descent of the infection. His technic briefly is to open the neck in front of the sternomastoid muscle, bluntly dissecting down to the anterior margin of the vascular sheath. The omohyoid muscle is divided and, following the course of the vessels, an iodoform gauze strip is packed in place at their lowermost limit to wall off the anterior mediastinum. The thyroid gland is then lifted forward and an iodoform gauze tampon inserted beneath it to the wall off the posterior mediastinum. The abscess cavity is then drained. Marschik refers to this procedure as prophylactic mediastinotomy.

Cancer of Esophagus. P. Guns[6] believes that the only way in which the present 100 per cent mortality in cancer of the esophagus can be lowered is by the more extensive use of esophagoscopy. He states that in all cases of esophageal dysphagia, regardless of its nature, the patients should be examined roentgenologically first, and then with the information obtained as a guide they should be examined with the esophagoscope.

Lupus of the Esophagus. H. H. Forbes† believes this to be an outstanding case. The patient was a woman, aged 32, whose chief symptom was dysphagia. Fluids passed fairly freely, but solid food seemed to "stick" in swallowing. Lupus lesions were seen on the nose ex-

(6) Arch. d. mal. de l'app. digestif., April, 1929.
(†) Arch. Otolaryng., April, 1929.

ternally and on the septum. A healed lesion was seen on the soft palate. The patient had received previous treatment for these lesions. At this time, she did not show any evidence of pulmonary lesions: there were no cough, no night sweats and no sputum. The Wassermann reaction was negative.

Direct examination of the esophagus showed a contraction of the lumen of the esophagus beginning at a point about 20 cm. from the upper teeth and extending downward about 3 or 4 cm. due to an ulceration involving the posterior and left lateral wall. The lesion was practically healed but showed the typical lesion of lupus so often seen on the skin of the face and on the mucous membrane of the nose and the soft palate.

The description given in the textbooks might be applied to this lesion. It consisted of minute pinkish-yellow nodules, the so-called "apple jelly" nodules. Some were broken down, but there were few as compared to those in the healed areas, the contraction of the latter being the cause of the partial obstruction. The author was able to dilate the strictured area and pass a 11 mm. esophagoscope beyond the lesion, the mucous membrane appearing normal. Following the operation the patient appeared relieved and returned to her home.

Until recently the patient has not reported any further trouble with swallowing, and the general condition is greatly improved.

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